

Previous Years' Paper
Common University Entrance Test for UG Programmes
CUET-UG - Biology
Entrance Exam, 2025

(After the list of questions, the solution will Start.)

Q1. 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

Q2. Antibody molecule has:

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

Q3. Choose the correct equation from the following options to show correct relationship between Gross Productivity (GPP), Respirational Losses (R) and Net Primary Productivity (NPP).

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

Q4. Match List-I with List-II

List-I	List-II
Disease	Characteristic symptoms
(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

Choose the correct answer from the options given below:

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

Q5. Match List-I to List-II

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

Choose the correct options:

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

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

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

Q7. Match List-I with List-II

List I	List II
Technique / Term	Features
(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

Choose the correct options:

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

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

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

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.

Choose the correct answer from the options given below.

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

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

- (A) Lippes Loop
- (B) LNG-20
- (C) Saheli
- (D) Implants

Choose the correct answer from the options given below:

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

Q12. Match the List-I with List-II

List-I	List-II
Character	Recessive Trait
(A) Flower Colour	(I) Green
(B) Seed Colour	(II) Yellow
(C) Pod Colour	(III) Constricted
(D) Pod Shape	(IV) White

Choose the correct answer from the options given below:

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

2. (A) – (IV), (B) – (IV), (C) – (I), (D) – (III)

3. (A) – (II), (B) – (I), (C) – (IV), (D) – (III)

4. (A) – (IV), (B) – (I), (C) – (II), (D) – (III)

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

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

(A) Haemophilia

(B) Down's Syndrome

(C) Thalassemia

(D) Turner's Syndrome

Choose the correct answer from the options given below:

1. (B) and (D) only

2. (A), (B) and (C) only

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

4. (A) and (C) only

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

1. AABBCC

2. aabbcC

3. AaBDCC

4. aaBbcC

Q16. Match List-I with List-II

List-I	List-II
Name of the gene	Encodes

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

Choose the correct answer from the options given below:

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

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.

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

Choose the correct options given below

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

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>

Choose the correct answer from the options given below:

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

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

1. Bacteria
2. Plasmid
3. Enzyme
4. Purine

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

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

Choose the correct answer from the options given below:

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

4. (C), (D), (A), (B)

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

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

Choose the correct answer from the options given below:

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

Q23. Baculoviruses are pathogens that attack:

- 1. Insects
- 2. Roundworms
- 3. Molluscs
- 4. Birds

Q24. The number of individuals in the reproductive age group is more than the number of individuals in the prereproductive 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

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.

Choose the correct answer from the options given below:

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

2. (A), (B) and (C) only

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

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

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

(A) Angiosperms

(B) Seed ferns

(C) Rhynia type plants

(D) Psilophyton

Choose the correct answer from the options given below:

1. (C), (D), (B), (A)

2. (A), (C), (B), (D)

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

4. (C), (B), (D), (A)

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

Q28. Thorn of Bougainvillea and tendril of Cucurbita are:

1. Homologous structures

2. Analogous structures

3. Vestigial structures

4. Developing structures

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

Q30. The first isolated restriction endonuclease was:

1. *Hind II*

2. *EcoR I*

3. *BamHI*

4. *Pvu II*

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

(A) Biogas

(B) Activated sludge

(C) Flocs

(D) Primary sludge

Choose the correct options given below :

1. (A), (B), (C), (D)

2. (D), (C), (B), (A)

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

4. (B), (A), (D), (C)

Q32. Wildlife safari parks are example of

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

Q33. Humification leads to:

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

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%

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

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

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

1. Mammary glands

2. Uterus

3. Ovaries

4. Cervix

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

1. Secondary spermatocytes

2. Primary spermatocytes

3. Leydig cells

4. Sertoli cells

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%

Q40. ELISA is based on the principle of -

1. Antigen - antibody interaction

2. PCR

3. Radioactive molecule

4. Amount of DNA

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

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

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

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

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

Read the passage carefully and answer the questions based on the 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 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

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

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

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

Q49. Formation of diploid zygote is a result of:

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

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

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

Solution

Q1.

Ans.

The correct answer is **Option 2. Filiform apparatus**

Explanation:

The filiform apparatus—finger-like wall ingrowths of the synergids at the micropylar end—serves as the guiding structure that directs the pollen tube into the embryo sac. The micropyle is only the opening, and antipodal cells are at the opposite (chalazal) end.

Q2.

Ans.

The correct answer is **Option 3. Four peptide chain**

Explanation:

A typical antibody (immunoglobulin) consists of **four polypeptide chains**—**two identical heavy chains** and **two identical light chains**—linked by disulfide bonds to form a Y-shaped molecule.

Q3.

Ans.

The correct answer is **Option 4. $GPP - R = NPP$**

Explanation:

By definition, **Net Primary Productivity** is what remains of **Gross Primary Productivity** after plants use some energy for **respiration (R)**, so $NPP = GPP - R$.

Q4.

Ans.

The correct answer is **Option 3. (A) – (II), (B) – (I), (C) – (IV), (D) – (III)**

Explanation:

- **Malaria** → (II) **Cycles of fever:** malarial paroxysms occur periodically with chills and fever.
- **Filariasis** → (I) **Inflammation of lower limb:** Wuchereria causes lymphatic blockage leading to painful swelling/elephantiasis of legs.
- **Ringworms** → (IV) **Scaly lesions on nails:** dermatophytic infection (tinea) produces scaly, ring-like lesions; can involve nails.
- **Amoebiasis** → (III) **Blood clots and excess mucus in stools:** Entamoeba histolytica causes amoebic dysentery with blood and mucus in stools.

Q5.

Ans.

The correct answer is **Option 2. (A) – (II), (B) – (III), (C) – (IV), (D) – (I)**

Explanation:

- **Clostridium butylicum** → (II) Butyric acid (butyric fermentation).
- **Aspergillus niger** → (III) Citric acid (major industrial source).
- **Acetobacter aceti** → (IV) Acetic acid (oxidizes ethanol → vinegar).
- **Lactobacillus** → (I) Lactic acid (lactic fermentation of sugars).

Q6.

Ans.

The correct answer is **Option 2. Chalaza.**

Explanation:

- The **micropyle** is the small opening at one end of the ovule.
- The **chalaza** is the **opposite end** of the ovule where the integuments and nucellus meet.
- **Hilum** is the seed's attachment scar to the funicle; **funicle** is the stalk; **nucellus** is the internal nutritive tissue—not an “end.”

Q7.

Ans.

The correct answer is **Option 2. (A) – (IV), (B) – (III), (C) – (II), (D) – (I)**

Explanation:

- **Amniocentesis → (IV) Testing of sex:** Prenatal sampling of amniotic fluid; fetal karyotyping reveals chromosomal sex and genetic disorders.
- **Maternal mortality rate → (III) Death rate:** Number of maternal deaths due to pregnancy/childbirth-related causes per 100,000 live births.
- **Vasectomy → (II) Ligation of vas deferens:** Male sterilization by cutting/sealing the vas deferens to prevent sperm in semen.
- **Tubectomy → (I) Ligation of fallopian tube:** Female sterilization by blocking/cutting the fallopian tubes to prevent fertilization.

Q8.

Ans.

The correct answer is **Option 2. Cytokine barriers.**

Explanation:

- **Interferons** are signaling proteins (cytokines) released by virus-infected cells.
- They alert nearby **uninfected cells** and induce an **antiviral state** (synthesis of antiviral proteins that inhibit viral replication), thus forming a **cytokine barrier**.
- They are not physical barriers (skin/mucus), physiological barriers (pH, temperature), or cellular barriers (phagocytes, NK cells).

Q9.

Ans.

The correct answer is **Option 3. Transcription.**

Explanation:

- **Transcription** is the synthesis of RNA using one DNA strand as the template, carried out by RNA polymerase.
- **Replication** = DNA → DNA; **Translation** = mRNA → protein; **Regulation** = control of gene expression, not copying.

Q10.

Ans.

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

Explanation:

- (D) **Zygote → morula:** After fertilization, the zygote undergoes rapid mitotic cleavages to form an 8–16 cell **morula**.
- (C) **Morula → blastocyst:** The embryo develops a cavity; cells segregate into **trophoblast** (outer layer) and **inner cell mass (ICM)**.
- (A) **Implantation:** The **blastocyst** reaches the uterus and **embeds in the endometrium**.
- (B) **Chorionic villi:** Post-implantation, the trophoblast proliferates to form **finger-like chorionic villi**, which participate in placenta formation.

Q11.

Ans.

The correct answer is Option 2. (C) and (D) only

Explanation:

Intrauterine devices (IUDs) are small, T-shaped or loop-shaped devices inserted into the uterus to prevent pregnancy. Common examples include the **Lippes Loop** and **LNG-20** (levonorgestrel-releasing IUD).

- **Lippes Loop (A):** An early type of inert plastic IUD.
- **LNG-20 (B):** A hormonal IUD that releases levonorgestrel.
- **Saheli (C):** Not an IUD; it is an **oral non-steroidal contraceptive pill**.
- **Implants (D):** Not an IUD; these are **subdermal contraceptive implants** placed under the skin.

Thus, **Saheli and implants** are not intrauterine devices.

Q12.

Ans.

The correct answer is Option 4. (A)–(IV), (B)–(I), (C)–(II), (D)–(III)

Explanation:

- Flower colour (A) → White (IV) is recessive (purple/violet is dominant).
- Seed colour (B) → Green (I) is recessive (yellow is dominant).
- Pod colour (C) → Yellow (II) is recessive (green is dominant).
- Pod shape (D) → Constricted (III) is recessive (inflated is dominant).

Hence, the correct matching is A-IV, B-I, C-II, D-III.

Q13.

Ans.

The correct answer is **Option 2. Methyl guanosine triphosphate**

Explanation:

- **Transcription in bacteria** involves synthesizing RNA from a DNA template. The key components are:
 - **DNA-dependent RNA polymerase** → catalyzes RNA synthesis.
 - **Sigma factor** → guides RNA polymerase to the promoter region.
 - **Rho factor** → involved in **termination** of transcription in some bacterial genes.
- **Methyl guanosine triphosphate (m⁷GTP)** is part of the **5' cap structure** in eukaryotic mRNA, which stabilizes the transcript and aids in translation. **It is not involved in bacterial transcription**, since bacteria do not cap their mRNAs.

Q14.

Ans.

The correct answer is **Option 1. (B) and (D) only**

Explanation:

Aneuploidy is a chromosomal abnormality where the number of chromosomes is **not an exact multiple of the haploid number**, leading to extra or missing chromosomes.

- **Down's Syndrome (B):** Caused by **trisomy 21** (an extra copy of chromosome 21).

- **Turner's Syndrome (D):** Caused by **monosomy X** (a female has only one X chromosome).
- **Haemophilia (A):** Caused by a mutation in a gene on the X chromosome, not due to aneuploidy.
- **Thalassemia (C):** Caused by mutations in the globin genes, not due to chromosomal number changes.

Thus, **Down's Syndrome** and **Turner's Syndrome** are the disorders resulting from **aneuploidy**.

Q15.

Ans.

The correct answer is **Option 4. aaBbcC**

Explanation:

- **Skin colour in humans** is an example of **polygenic inheritance**, controlled by **multiple genes** (A, B, C, etc.).
- Each **dominant allele** contributes to **darker pigmentation**, while **recessive alleles** contribute to lighter pigmentation.
- An **intermediate skin colour** occurs when there is a **mix of dominant and recessive alleles** across these genes.

Analysis of options:

1. **AABBCC** → All dominant alleles → **very dark skin**
2. **aabbcc** → All recessive alleles → **very light skin**
3. **AaBDCC** → Mostly dominant alleles → **dark skin**
4. **aaBbcC** → Mix of dominant and recessive alleles → **intermediate skin colour**

Hence, **aaBbcC** will express **intermediate skin colour**.

Q16.

Ans.

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

Explanation:

- 'i' gene (A) → Repressor (II) (regulator gene codes the lac repressor).
- 'z' gene (B) → β -galactosidase (IV) (lacZ).
- 'y' gene (C) → Permease (I) (lacY).
- 'a' gene (D) → Transacetylase (III) (lacA).

Hence, matching is **A-II, B-IV, C-I, D-III**.

Q17.

Ans.

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

Explanation:

- **Cannabinoids:** Affect the **cardiovascular system**, increasing heart rate and blood pressure.
- **Heroin:** Derived from the **latex of Papaver somniferum** (opium poppy).
- **Nicotine:** **Is not a sedative or pain killer**; it is a **stimulant** that increases alertness, heart rate, and blood pressure.
- **Coca alkaloid (cocaine):** Excessive dosage can cause **hallucinations**, paranoia, and other psychological effects.

Thus, the statement about nicotine being a sedative and pain killer is **incorrect**.

Q18.

Ans.

The correct answer is **Option 2. (B), (A), (D), (C)**

Explanation:

The correct sequence of steps in **gel electrophoresis for DNA separation** is:

1. **Staining with ethidium bromide (B):** DNA is first treated with **ethidium bromide**, which intercalates between base pairs and allows visualization.

2. **Exposure to UV light (A):** The gel is observed under UV light to visualize DNA fragments.
3. **Elution (D):** Desired DNA fragments can be extracted (eluted) from the gel for further use.
4. **Moving of DNA fragments towards anode (C):** DNA fragments migrate through the gel matrix towards the positively charged anode due to their negative phosphate backbone.

Thus, the correct order is staining → UV visualization → elution → migration towards anode.

Q19.

Ans.

The correct answer is **Option 1. (A)-(IV), (B)-(III), (C)-(II), (D)-(I)**

Explanation:

- **Citric acid (A) → Aspergillus niger (IV):** industrial production of citric acid by this fungus.
- **Ethanol (B) → Saccharomyces cerevisiae (III):** yeast fermentation yields ethanol.
- **Statins (C) → Monascus purpureus (II):** produces cholesterol-lowering statins.
- **Cyclosporin A (D) → Trichoderma polysporum (I):** immunosuppressant from this fungus.

Q20.

Ans.

The correct answer is **Option 3. Enzyme**

Explanation:

- **EcoRI is a restriction endonuclease enzyme** isolated from *Escherichia coli* bacteria.
- It is widely used in **recombinant DNA (rDNA) technology** to cut DNA at **specific recognition sites**, producing sticky ends that facilitate the insertion of genes into vectors.

- It is not a bacterium, plasmid, or purine, but a biochemical tool (enzyme) essential for molecular cloning.

Q21.

Ans.

The correct answer is **Option 4. (C), (D), (A), (B)**

Explanation:

The correct chronological order of the given geological periods from **latest to oldest** is:

- **Tertiary (C):** Latest, part of the **Cenozoic Era** (~66–2.6 million years ago)
- **Jurassic (D):** Middle, part of the **Mesozoic Era** (~201–145 million years ago)
- **Triassic (A):** Earlier, part of the **Mesozoic Era** (~252–201 million years ago)
- **Carboniferous (B):** Oldest, part of the **Paleozoic Era** (~359–299 million years ago)

Hence, the correct sequence is: **Tertiary → Jurassic → Triassic → Carboniferous.**

Q22.

Ans.

The correct answer is **Option 1. (A), (B) and (D) only**

Explanation:

Polymerase Chain Reaction (PCR) is a technique used to **amplify DNA** and involves three main steps in each cycle:

1. **Denaturation (D):** The double-stranded DNA is heated to separate it into two single strands.
2. **Annealing (B):** The temperature is lowered to allow **primers** to bind (anneal) to the complementary sequences on the single-stranded DNA.
3. **Extension (A):** DNA polymerase synthesizes the new DNA strand by adding nucleotides complementary to the template.

Propagation (C) is not a standard PCR step; it refers generally to multiplication of organisms, not the molecular steps of PCR.

Thus, the correct steps are **Extension, Annealing, and Denaturation**.

Q23.

Ans.

The correct answer is **Option 1. Insects**

Explanation:

- **Baculoviruses** are a family of viruses that specifically infect **insects**, particularly **Lepidoptera (moths and butterflies)**, **Hymenoptera (wasps and bees)**, and **Diptera (flies)**.
- They are used in **biological pest control** because of their specificity and safety to plants, humans, and other animals.
- **Baculoviruses do not infect roundworms, molluscs, or birds**, making them ideal for environmentally friendly insect management.

Q24.

Ans.

The correct answer is **Option 1. Expanding**

Explanation:

- An **age pyramid** shows the distribution of a population across different age groups.
- If the **reproductive age group (15–44 years)** is larger than the **prereproductive age group (0–14 years)**, it indicates that **more individuals are capable of reproducing**, leading to a **high potential for population growth**.
- Such a population exhibits **expanding growth**, typically represented by a **broad middle section** in the age pyramid, sometimes even wider at the base if birth rates remain high.

Hence, the growth status of the population would be **expanding**.

Q25.

Ans.

The correct answer is Option 1. (A), (B) and (D) only

Explanation:

- (A) Homology indicates common ancestry: Correct. Homologous organs have a **similar structural origin** even if their functions differ.
- (B) Whale and Cheetah share similarities in forelimb bones: Correct. The **forelimbs of vertebrates** like whales and cheetahs show **similar bone patterns**, indicating homology.
- (C) Vertebrate heart as homologous organs: Incorrect. The **heart** is considered **analogous** across vertebrates, as it performs the same function but may vary in structure; homology is based on **structural similarity**.
- (D) Thorn of Bougainvillea and tendrils of Cucurbita: Correct. Both are **modified shoots**, showing homology despite functional differences.

Hence, statements (A), (B), and (D) are true.

Q26.

Ans.

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

Explanation:

The appearance of plants on Earth followed an evolutionary timeline:

- Rhynia type plants (C): Early vascular plants appeared during the Silurian-Devonian period.
- Psilophyton (D): Primitive vascular plants evolved slightly later in the Devonian period.
- Seed ferns (B): These **gymnosperm-like plants** appeared in the late Devonian to Carboniferous period.
- Angiosperms (A): Flowering plants evolved much later, during the Cretaceous period.

Hence, the chronological order of appearance is: **Rhynia** → **Psilophyton** → **Seed ferns** → **Angiosperms**.

Q27.

Ans.

The correct answer is **Option 3. Third**

Explanation:

- In a food chain:
 1. **Producers** (plants, phytoplankton) occupy the **first trophic level**.
 2. **Primary consumers** (herbivores that eat producers) occupy the **second trophic level**.
 3. **Secondary consumers** (carnivores or omnivores that eat herbivores or primary consumers) occupy the **third trophic level**.
- If a man eats **fish**, the fish are typically **primary or secondary consumers** feeding on smaller aquatic organisms (like plankton or smaller fish). Therefore, the man becomes a **secondary consumer**, placing him at the **third trophic level** in the food chain.

Q28.

Ans.

The correct answer is **Option 1. Homologous structures**

Explanation:

- **Thorn of Bougainvillea** and **tendril of Cucurbita** are both modified **shoots**, meaning they share a **common origin** in the plant's anatomy, even though their functions are different (protection vs. climbing).
- **Homologous structures** are organs that **have the same structural origin** but may perform **different functions**.
- **Analogous structures**, in contrast, have **different origins** but similar functions.
- Therefore, these structures are **homologous**.

Q29.

Ans.

The correct answer is **Option 2. Inverted pyramid of biomass**

Explanation:

In aquatic ecosystems, a **small standing crop of phytoplankton** (producers) can support a **large biomass of zooplankton** (primary consumers) because phytoplankton reproduce and grow rapidly.

- **Pyramid of biomass:** Shows the total mass of organisms at each trophic level at a given time.
- In this case, the **biomass of producers (phytoplankton)** is less than that of consumers (zooplankton), resulting in an **inverted pyramid of biomass**.
- **Pyramid of energy:** Always upright, because energy transfer between trophic levels is never 100% efficient.

Hence, the scenario is best represented by an **inverted pyramid of biomass**.

Q30.

Ans.

The correct answer is **Option 1. Hind II**

Explanation:

- The first restriction endonuclease to be isolated was **HindII**, discovered in **1970** by **Hamilton Smith and his coworkers** from **Haemophilus influenzae Rd strain II**.
- **HindII cuts DNA at specific internal recognition sequences**, a property that became essential for **molecular biology and genetic engineering**.
- Other enzymes like **EcoRI, BamHI, and PvuII** were discovered later and are also widely used in recombinant DNA technology.

Q31.

Ans.

The correct answer is **Option 2. (D), (C), (B), (A)**

Explanation:

During **sewage treatment**, the sequence of products formed is as follows:

1. **Primary sludge (D):** Formed during **primary sedimentation**, where heavier solids settle down.
2. **Flocs (C):** In the **secondary treatment**, microorganisms aggregate to form **flocs** that help in removing organic matter.
3. **Activated sludge (B):** Flocs that are rich in microbial biomass are termed **activated sludge**, which is used to further degrade pollutants.
4. **Biogas (A):** In the **anaerobic digestion** of primary or secondary sludge, microorganisms produce **biogas** (methane + CO₂) as a byproduct.

Hence, the correct sequence is: **Primary sludge → Flocs → Activated sludge → Biogas.**

Q32.

Ans.

The correct answer is **Option 2. In situ conservation**

Explanation:

Wildlife safari parks are examples of **in situ conservation**, where plants and animals are **protected in their natural habitats or semi-natural environments**. In such areas, species are conserved within ecosystems that maintain ecological processes, allowing natural interactions to continue.

Other options:

- **Ex situ conservation:** involves conserving species **outside their natural habitats**, such as in **zoos, botanical gardens, or seed banks**.
- **Biodiversity hotspots:** regions with high species richness and endemism, not necessarily a conservation method.
- **Sacred groves:** traditional protected areas, also an example of **in situ conservation** but culturally specific.

Hence, wildlife safari parks fall under **in situ conservation**.

Q33.

Ans.

The correct answer is **Option 3. Accumulation of humus**

Explanation:

Humification is the process by which **dead plant and animal matter** is decomposed by microorganisms and converted into **humus**, a dark, organic component of soil. Humus improves soil fertility by:

- Increasing water retention
- Enhancing nutrient availability
- Improving soil structure

Other options:

- **Soil erosion:** \times Humification does not cause soil loss.
- **Soil conservation:** \times While humus helps soil quality, humification itself is a natural decomposition process, not a direct conservation method.
- **Accumulation of salts:** \times Humification does not lead to salt accumulation.

Therefore, humification primarily results in the **accumulation of humus** in soil.

Q34.

Ans.

The correct answer is **Option 3. 35%**

Explanation:

According to **Chargaff's rules** for double-stranded DNA:

- The amount of **adenine (A) = thymine (T)**
- The amount of **guanine (G) = cytosine (C)**
- The total percentage of all bases = 100%

Given: $A = 15\%$

- Therefore, $T = 15\%$

- Total A + T = 15% + 15% = 30%

The remaining percentage is for G + C:

$$100\% - 30\% = 70\%$$

Since G = C, each contributes half of 70%:

$$C = \frac{70}{2} = 35\%$$

Hence, the percent of cytosine in the DNA is 35%.

Q35.

Ans.

The correct answer is **Option 3. Cancer and cystic fibrosis**

Explanation:

Transgenic animals are genetically modified to carry foreign genes, allowing researchers to study the effects of specific genes on biological processes and disease development. They are particularly valuable in modeling **genetic and chronic diseases**, such as **cancer** and **cystic fibrosis**, where gene function and mutation contribute to disease progression. These models help in understanding disease mechanisms and testing potential therapies. Diseases like cholera, typhoid, pneumonia, elephantiasis, ringworm, and kala-azar are **infectious or parasitic** and are typically studied using microbial or pathogen models rather than transgenic animals.

Q36.

Ans.

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

Explanation:

Genetically modified (GM) plants are engineered to enhance desirable traits. One of the key applications is **improving stress tolerance**, which includes resistance to:

- **Biotic stresses:** pests, diseases
- **Abiotic stresses:** drought, salinity, extreme temperatures

This modification helps increase crop productivity and stability. GM plants do not increase post-harvest losses, decrease crop yield, or reduce mineral usage efficiency; in fact, they are designed to improve overall crop performance and resource utilization.

Q37.

Ans.

The correct answer is **Option 3. Ovaries**

Explanation:

The primary female sex organs, also called **gonads**, are the ovaries. They are responsible for:

- Producing female gametes (ova or eggs)
- Secreting sex hormones such as **estrogen** and **progesterone**, which regulate the menstrual cycle and secondary sexual characteristics.

Other options:

- **Mammary glands:** secondary sexual characteristic, involved in lactation.
- **Uterus:** site of implantation and fetal development, not a primary sex organ.
- **Cervix:** lower part of the uterus, also not a primary sex organ.

Q38.

Ans.

The correct answer is **Option 1. Secondary spermatocytes**

Explanation:

In the **male reproductive system**, spermatogenesis occurs in the **seminiferous tubules** of the testes:

- **Primary spermatocytes** → diploid (2n), formed from spermatogonia; undergo **meiosis I**.
- **Secondary spermatocytes** → haploid (n), result from **meiosis I** of primary spermatocytes; each contains **half the chromosome number**.
- **Leydig cells** → diploid somatic cells; secrete **testosterone**.

- **Sertoli cells** → diploid somatic cells; support and nourish developing sperm.

Thus, the **haploid cells** in the male reproductive system are the **secondary spermatocytes**, which further divide by **meiosis II** to form spermatids.

Q39.

Ans.

The correct answer is **Option 2. Less than 50%**

Explanation:

Photosynthetically Active Radiation (PAR) is the portion of sunlight that plants can use for **photosynthesis**, spanning the wavelength range of **400–700 nm** (violet to red light). While the sun emits a broad spectrum of radiation—including ultraviolet (<400 nm) and infrared (>700 nm)—only the visible portion is effectively usable by plants. Of the total solar radiation incident on Earth, **less than 50%** falls within this PAR range, as a significant fraction is in the ultraviolet or infrared regions, which plants cannot use for photosynthesis.

Q40.

Ans.

The correct answer is **Option 1. Antigen–antibody interaction.**

Explanation:

- **ELISA (Enzyme-Linked Immunosorbent Assay)** detects or measures **antigens or antibodies** using their **specific binding** to each other.
- An **enzyme-linked** antibody produces a **color change**; the intensity reflects the amount of target present.
- **Not PCR** (nucleic acid amplification), **not radioactive molecules** (that's RIA), and **not measuring DNA amount**.

Q41.

Ans.

The correct answer is **Option 1. Zoological park.**

Explanation:

- **In-situ** = conservation in natural habitats (e.g., **national parks, wildlife sanctuaries, biosphere reserves**).
- **Zoological parks** are **ex-situ** (off-site) conservation facilities.

Q42.

Ans.

The correct answer is **Option 2. Pollination**.

Explanation:

- **Narrowly utilitarian** = direct consumptive uses like **medicines, construction materials, industrial products**.
- **Pollination** is an **ecosystem service** (broadly utilitarian), not a direct product.

Q43.

Ans.

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

Explanation:

- High tropical diversity is linked to **greater solar energy, stable/less seasonal climate, and being undisturbed for millions of years**.
- **Frequent glaciations** cause extinctions and **do not** explain tropical richness.

Q44.

Ans.

The correct answer is **Option 3. Five**.

Explanation: Earth has witnessed **five** major mass extinction events since life diversified (e.g., end-Ordovician, Devonian, Permian, Triassic, and Cretaceous).

Q45.

Ans.

The correct answer is **Option 2. Amazon forests**.

Explanation:

- India's biodiversity hotspots include **Western Ghats–Sri Lanka, Indo-Burma, and Himalaya** (also Nicobar within Sundaland).
- **Amazon forests** are in South America and **do not** cover India.

Q46.

Ans.

The correct answer is **Option 1. Endosperm develops into seed**

Explanation:

This statement is **incorrect**. After fertilization, the **ovule develops into the seed**, and the ovary develops into the fruit. The passage clearly states that the "primary endosperm cell forms the endosperm tissue," which serves as nutrition for the developing embryo inside the seed.

Q47.

Ans.

The correct answer is **Option 4. Epiblast**

Explanation:

The development of a dicot embryo progresses through the **proembryo, globular, and heart-shaped** stages before maturing. The **epiblast** is a small, flap-like, undifferentiated structure considered to be a vestigial (undifferentiated) second cotyledon in the embryos of some **monocots**, like grasses. It is not part of dicot embryogenesis.

Q48.

Ans.

The correct answer is **Option 1. Free-nuclear endosperm**

Explanation:

The passage states that the primary endosperm cell forms the endosperm. In coconuts, the primary endosperm nucleus undergoes thousands of mitotic divisions without immediate cell wall formation. This creates a liquid multinucleate cytoplasm called the **free-nuclear endosperm**, which is the nutritious coconut water. The white kernel that forms later is the cellular endosperm.

Q49.

Ans.

The correct answer is **Option 3. Syngamy**

Explanation:

The passage mentions two key fusion events: syngamy and triple fusion. **Syngamy** is the specific process where one of the male gametes (haploid, n) fuses with the female gamete (the egg cell, also haploid, n) to form the **diploid ($2n$) zygote**. Triple fusion, on the other hand, results in the triploid endosperm.

Q50.

Ans.

The correct answer is **Option 3. 19**

Explanation:

A zygote is formed by the fusion of a haploid male gamete (n) and a haploid egg cell (n), making the zygote **diploid ($2n$)**.

- Given: Number of chromosomes in the diploid zygote ($2n$) = 38.
- To find the number of chromosomes in the haploid egg cell (n), we simply divide the zygote's chromosome number by 2.
- Therefore, to find the number of chromosomes in the haploid egg cell, you must divide the number of chromosomes in the diploid zygote by 2.

$$n = 2n/2$$

$$n = 38/2$$

$$n = 19$$