CUET 2026 May 19 Shift 1 Biology

Question Paper (Memory-Based) with Solutions

Conducted by National Testing Agency (NTA)

General Instructions

(i) The examination will be conducted in Computer-Based Test (CBT) mode.

(ii) Each question carries +5 marks for correct answer and -1 mark for wrong answer.

(iii) The total number of questions are 50.

(iv) Duration of the exam is 1 hour (60 minutes).

1. In flowering plants, the pollen grain at the time of shedding from the anther is generally:

(A) Three-celled with one vegetative cell and two male gametes

(B) Two-celled with one vegetative cell and one generative cell

(C) Four-celled with one tube nucleus and three male gametes

(D) Uninucleate and non-vacuolated

Correct Answer: (B) Two-celled with one vegetative cell and one generative cell

Solution:

In flowering plants (angiosperms), development of the male gametophyte begins inside the microsporangium of the anther through the process of microsporogenesis.

Inside the pollen sacs, diploid microspore mother cells or pollen mother cells undergo meiosis to produce four haploid microspores arranged in a tetrad. Each microspore later develops into a pollen grain.

The young microspore is initially uninucleate. As development proceeds, the nucleus of the microspore undergoes an unequal mitotic division. This unequal division gives rise to two distinct cells:

- One large vegetative cell or tube cell

- One small generative cell

The vegetative cell:

- Possesses abundant cytoplasm and food reserves
- Has a large irregular nucleus
- Controls pollen tube growth during germination
- Forms the pollen tube after pollination

The generative cell:

- Is smaller and spindle-shaped
- Lies freely in the cytoplasm of vegetative cell
- Eventually divides mitotically to produce two male gametes

In nearly 60% of angiosperms, pollen grains are released from the anther at this two-celled stage. Therefore, at the time of shedding, the pollen grain usually contains:

- One vegetative cell
- One generative cell

After pollination, the generative cell divides mitotically inside the pollen tube to form two male gametes required for double fertilization.
However, in some angiosperms, the generative cell divides before pollen release. In such cases, the pollen grain is shed at the three-celled stage containing:

- One vegetative cell
- Two male gametes

Now let us analyze all the options carefully.
Option (A):

- This condition occurs only in some angiosperms.
- It is not the general condition.
- Therefore, this option is incorrect.

Option (B):

- This represents the most common condition in flowering plants.
- Pollen grain contains one vegetative cell and one generative cell.
- Therefore, this option is correct.

Option (C):

- Pollen grains do not contain three male gametes.
- Angiosperms require only two male gametes for double fertilization.
- Therefore, this option is biologically incorrect.

Option (D):

- Mature pollen grains are not generally uninucleate at shedding.
- They usually become two-celled before release.
- Hence, this option is incorrect.

Thus, the correct answer is:

(B)

Quick Tip: Most angiosperms shed pollen grains at the 2-celled stage consisting of one vegetative cell and one generative cell.

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2. Arrange the following wall layers of microsporangium from outermost to innermost:

I. Tapetum

II. Middle layers

III. Epidermis

IV. Endothecium

(A) III, IV, II, I

(B) III, II, IV, I

(C) IV, III, II, I

(D) I, II, III, IV

Correct Answer: (A) III, IV, II, I

Solution:

The anther is the male reproductive part of a flower and is responsible for the production of pollen grains. A typical anther is bilobed and each lobe contains two microsporangia or pollen sacs.

Each microsporangium is surrounded by four distinct wall layers arranged concentrically from outermost to innermost. These layers play important roles in protection, nourishment, and development of pollen grains.

The four layers are:

1. Epidermis
2. Endothecium
3. Middle layers
4. Tapetum

Let us understand each layer in detail.

1. Epidermis

- Epidermis is the outermost protective layer of the anther wall.
- It consists of compactly arranged cells.
- It protects the internal tissues of the microsporangium from mechanical injury and desiccation.
- Being the outermost layer, it forms the first boundary of the anther wall.

2. Endothecium

- Endothecium lies just below the epidermis.

- Cells of endothecium develop fibrous thickenings.
- These thickenings help in anther dehiscence.
- At maturity, endothecium assists in splitting open the anther to release pollen grains.

3. Middle Layers

- Middle layers are situated between endothecium and tapetum.
- Usually one to three layers thick.
- They temporarily store nutrients for developing microspores.
- These layers degenerate during later stages of pollen development.

4. Tapetum

- Tapetum is the innermost wall layer of the microsporangium.
- It surrounds the sporogenous tissue directly.
- Cells of tapetum are large, dense, and rich in nutrients.
- Tapetum provides nourishment to developing pollen grains.
- It also produces enzymes, proteins, and precursors required for pollen wall formation.
- Tapetal cells may become multinucleate or polyploid due to high metabolic activity.

Therefore, the correct arrangement from outermost to innermost is:

$$\text{Epidermis} \rightarrow \text{Endothecium} \rightarrow \text{Middle layers} \rightarrow \text{Tapetum}$$

Now matching this arrangement with Roman numerals:

$$\text{III} \rightarrow \text{IV} \rightarrow \text{II} \rightarrow \text{I}$$

Hence, the correct option is:

$$\boxed{\text{(A)}}$$

Option analysis:

Option (A):

- Correct arrangement of all wall layers.
- Hence, correct answer.

Option (B):

- Incorrect placement of middle layers and endothecium.
- Hence, incorrect.

Option (C):

- Starts with tapetum as outermost layer.
- Tapetum is actually innermost.
- Hence, incorrect.

Option (D):

- Completely reversed arrangement.
- Hence, incorrect.

Therefore:

(A)

Quick Tip: Remember the sequence: Epidermis → Endothecium → Middle layers → Tapetum. Tapetum is always the innermost nutritive layer.

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3. Which of the following events occurs during spermiogenesis but not during spermatogenesis?

(A) Meiotic division of spermatocytes

(B) Formation of haploid cells

(C) Transformation of spermatids into spermatozoa

(D) Mitotic multiplication of spermatogonia

Correct Answer: (C) Transformation of spermatids into spermatozoa

Solution:

Sperm formation in human males occurs inside the seminiferous tubules of testes through a complex process called spermatogenesis. This process begins at puberty and continues throughout reproductive life.
Spermatogenesis includes several successive stages:

1. Multiplication phase
2. Growth phase
3. Maturation phase
4. Spermiogenesis

During the multiplication phase, diploid spermatogonia divide repeatedly by mitosis to maintain the germ cell population.
During the growth phase, spermatogonia enlarge to form primary spermatocytes.
During the maturation phase, primary spermatocytes undergo meiosis-I to form secondary spermatocytes, which further undergo meiosis-II to produce haploid spermatids.
At this stage, haploid cells have already been formed. However, spermatids are non-motile, rounded cells and cannot function as mature sperms.
The final transformation of spermatids into mature spermatozoa is called spermiogenesis.
During spermiogenesis:

- The nucleus becomes highly condensed
- Acrosome is formed from Golgi apparatus
- A flagellum develops for motility
- Mitochondria arrange in the middle piece
- Excess cytoplasm is discarded

Thus, spermiogenesis specifically refers to morphological differentiation of spermatids into spermatozoa and is distinct from the earlier stages of spermatogenesis.
Option analysis:

- Option (A): Incorrect because meiotic division occurs during maturation phase of spermatogenesis.

- Option (B): Incorrect because haploid spermatids are formed during meiosis.
- Option (C): Correct because spermiogenesis specifically converts spermatids into spermatozoa.
- Option (D): Incorrect because mitotic multiplication occurs in spermatogonia during early spermatogenesis.

Therefore, the correct answer is:

(C)

Quick Tip: Spermatogenesis produces spermatids, whereas spermiogenesis converts those spermatids into fully mature spermatozoa.

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4. Assertion (A): Filiform apparatus is important for pollen tube guidance.
Reason (R): Synergids secrete chemotropic substances that attract the pollen tube.

(A) Both A and R are true and R is the correct explanation of A
(B) Both A and R are true but R is not the correct explanation of A
(C) A is true but R is false
(D) A is false but R is true

Correct Answer: (A) Both A and R are true and R is the correct explanation of A

Solution:

The mature embryo sac in most angiosperms is typically 7-celled and 8-nucleate. At the micropylar end of the embryo sac lies the egg apparatus, which consists of:

- One egg cell
- Two synergids

The synergids are highly specialized cells that play a major role in guiding the pollen tube toward the egg apparatus.
Each synergid possesses a special finger-like wall thickening called the filiform apparatus.

These wall ingrowths increase the surface area of the synergids and help in absorption and transfer of nutrients.
The filiform apparatus also plays an extremely important role in directing the pollen tube toward the egg cell.
Synergids secrete certain chemotropic substances that attract the pollen tube chemically. Due to this chemical attraction, the pollen tube grows toward the micropylar end and usually enters one of the synergids.
Thus:

- The Assertion is true because filiform apparatus assists in pollen tube guidance.
- The Reason is also true because synergids produce chemotropic signals.
- The Reason correctly explains the Assertion since chemotropic guidance is associated with the synergids containing filiform apparatus.

Option analysis:

- Option (A): Correct
- Option (B): Incorrect because the reason directly explains the assertion
- Option (C): Incorrect because both statements are true
- Option (D): Incorrect because Assertion is also true

Hence, the correct answer is:

(A)

Quick Tip: Filiform apparatus is a characteristic feature of synergids and helps in attracting and guiding the pollen tube.

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5. Select the incorrect statement regarding meiosis in flowering plants.

(A) Microspore mother cell undergoes meiosis to produce tetrads

(B) Megaspore mother cell produces four megaspores after meiosis

(C) All four megaspores usually remain functional

(D) Meiosis reduces chromosome number to half

Correct Answer: (C) All four megaspores usually remain functional

Solution:

Meiosis is a reductional division that plays a fundamental role in sexual reproduction of flowering plants. It ensures maintenance of chromosome number across generations by reducing the diploid chromosome number to haploid.
In flowering plants, meiosis occurs during both microsporogenesis and megasporogenesis.
During microsporogenesis:

- A diploid microspore mother cell (PMC) undergoes meiosis.
- Four haploid microspores are produced.
- These microspores remain temporarily arranged in a tetrad.

Thus, statement (A) is correct.
During megasporogenesis:

- A diploid megaspore mother cell present inside the ovule undergoes meiosis.
- Four haploid megaspores are formed.

Thus, statement (B) is also correct.
However, in most angiosperms, only one of the four megaspores remains functional while the remaining three degenerate. The functional megaspore later develops into the female gametophyte or embryo sac.
Therefore, statement (C) is incorrect.
Statement (D) is correct because meiosis always reduces chromosome number from diploid to haploid.
Option analysis:

- Option (A): Correct
- Option (B): Correct
- Option (C): Incorrect
- Option (D): Correct

Hence, the correct answer is:

(C)

Quick Tip: In most flowering plants, only one megaspore remains functional and forms the embryo sac.

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6. During HIV infection, which sequence correctly represents the events inside host cells?

(A) Reverse transcription → RNA synthesis → Integration

(B) Integration → Reverse transcription → Viral protein synthesis

(C) Reverse transcription → Integration into host DNA → Viral replication

(D) Viral replication → Integration → Reverse transcription

Correct Answer: (C) Reverse transcription → Integration into host DNA → Viral replication

Solution:

Human Immunodeficiency Virus (HIV) is a retrovirus responsible for causing AIDS (Acquired Immunodeficiency Syndrome). HIV primarily attacks helper T-lymphocytes of the immune system.

Unlike most organisms that convert DNA into RNA, retroviruses possess RNA as genetic material and use a special enzyme called reverse transcriptase.

The sequence of events during HIV infection is as follows:

1. HIV enters the host helper T-cell.
2. Viral RNA is released into the cytoplasm.
3. Reverse transcriptase synthesizes complementary DNA from viral RNA. This process is called reverse transcription.
4. The newly formed viral DNA enters the nucleus.
5. Viral DNA integrates into the host chromosome and becomes a provirus.
6. Host cellular machinery synthesizes viral RNA and proteins.
7. New viral particles are assembled and released.

Thus, the correct sequence is:

$$\text{Reverse transcription} \rightarrow \text{Integration into host DNA} \rightarrow \text{Viral replication}$$

Option analysis:

- Option (A): Incorrect because integration occurs before synthesis of new viral RNA.
- Option (B): Incorrect because integration cannot occur before formation of viral DNA.
- Option (C): Correct
- Option (D): Incorrect sequence

Therefore:

$$\boxed{\text{(C)}}$$

Quick Tip: Retroviruses contain RNA and use reverse transcriptase to synthesize DNA inside host cells.

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7. Which statement correctly distinguishes VNTR from coding DNA sequences?

(A) VNTRs code for essential enzymes

(B) VNTRs show high polymorphism among individuals

(C) VNTRs are present only in prokaryotes

(D) VNTRs undergo translation

Correct Answer: (B) VNTRs show high polymorphism among individuals

Solution:

VNTR stands for Variable Number Tandem Repeats. These are short nucleotide sequences repeated many times in tandem arrangement.

VNTRs are mainly located in non-coding regions of DNA and do not code for proteins or enzymes.

The number of repeated units varies greatly from one individual to another. This variability or polymorphism makes VNTRs extremely useful in identification techniques.

Applications of VNTR:

- DNA fingerprinting
- Paternity testing
- Forensic investigations
- Identification of individuals

Since coding DNA sequences are comparatively conserved, they do not show the same degree of variation as VNTRs.
Option analysis:

- Option (A): Incorrect because VNTRs are non-coding DNA sequences.
- Option (B): Correct because VNTRs show high polymorphism.
- Option (C): Incorrect because VNTRs are commonly studied in eukaryotes.
- Option (D): Incorrect because VNTRs are not translated into proteins.

Hence:

(B)

Quick Tip: The variability in number of tandem repeats forms the basis of DNA fingerprinting.

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8. A pollen grain with 120 chromosomes undergoes normal development. What will be the chromosome number in each male gamete formed later?

(A) 120
(B) 240
(C) 60
(D) 30

Correct Answer: (A) 120

Solution:

Pollen grains in flowering plants are haploid structures. They develop from haploid microspores formed after meiosis in the pollen mother cell.
In the given question, the pollen grain already contains:

$$120 \text{ chromosomes}$$

This means:

$$n = 120$$

Inside the pollen grain:

- The generative cell undergoes mitotic division.
- Two male gametes are formed.

Since mitosis does not alter chromosome number, each male gamete will also contain:

$$120 \text{ chromosomes}$$

No reduction division occurs during formation of male gametes from the generative cell.
Option analysis:

- Option (A): Correct
- Option (B): Incorrect because chromosome number does not double.
- Option (C): Incorrect because meiosis is absent at this stage.
- Option (D): Incorrect

Therefore:

$$\boxed{\text{(A)}}$$

Quick Tip: Male gametes are produced by mitosis of the generative cell, so chromosome number remains unchanged.

9. Which of the following is correctly matched?

(A) Tapetum — Mechanical support

(B) Endothecium — Pollen nourishment

(C) Synergids — Filiform apparatus

(D) Antipodals — Male gamete production

Correct Answer: (C) Synergids — Filiform apparatus

Solution:

Different structures in flowering plants perform specialized reproductive functions.

Tapetum:

- It is the innermost layer of the anther wall.
- It provides nourishment to developing pollen grains.
- It secretes enzymes and sporopollenin precursors.

Thus, tapetum does not provide mechanical support. Hence option (A) is incorrect.

Endothecium:

- It lies below the epidermis.
- It develops fibrous thickenings.
- It helps in anther dehiscence.

Therefore, endothecium is not responsible for pollen nourishment. Hence option (B) is incorrect.

Synergids:

- They are part of the egg apparatus.
- They possess specialized wall ingrowths called filiform apparatus.
- They help in guiding the pollen tube.

Thus, option (C) is correctly matched.

Antipodals:

- They are located at the chalazal end of embryo sac.
- They mainly perform nutritive functions.
- They are not involved in male gamete production.

Hence option (D) is incorrect.
Therefore:

(C)

Quick Tip: Filiform apparatus is a distinctive feature of synergids and assists pollen tube entry.

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10. Select the correct sequence in gene expression in eukaryotes.

(A) DNA → mRNA → hnRNA → Protein
(B) DNA → hnRNA → mRNA → Protein
(C) hnRNA → DNA → mRNA → Protein
(D) DNA → Protein → mRNA

Correct Answer: (B) DNA → hnRNA → mRNA → Protein

Solution:

Gene expression is the process by which genetic information stored in DNA is utilized to synthesize proteins.
In eukaryotes, gene expression occurs in multiple stages.
Step 1: Transcription

- DNA acts as template.
- RNA polymerase synthesizes a primary RNA transcript.
- This initial transcript is called hnRNA (heterogeneous nuclear RNA).

hnRNA is immature and cannot directly participate in protein synthesis.
Step 2: RNA Processing The hnRNA undergoes:

- Capping at 5' end

- Tailing at 3’ end
- Splicing to remove introns

After processing, mature mRNA is formed.

Step 3: Translation

- Mature mRNA moves to ribosomes.
- Amino acids are assembled according to codon sequence.
- Protein synthesis occurs.

Thus, the correct sequence is:

$$\text{DNA} \rightarrow \text{hnRNA} \rightarrow \text{mRNA} \rightarrow \text{Protein}$$

Option analysis:

- Option (A): Incorrect because hnRNA forms before mature mRNA.
- Option (B): Correct
- Option (C): Incorrect order
- Option (D): Incorrect because mRNA formation precedes protein synthesis.

Therefore:

$$\boxed{\text{(B)}}$$

Quick Tip: hnRNA is the unprocessed primary transcript that becomes mature mRNA after splicing.

