STUDY MATERIAL

VIVEKANANDA COLLEGE THAKURPUKUR

NAAC Accredited Grade—A

BOTANY

(HONOURS & GENERAL)

Plant Cytology:

Identification of Permanent Slides

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Plant Cytology: Identification of Permanent Slides

1. Meiotic Stages:

Cells loosely arranged.
Cells round/oval in outline.
Presence of thick callose wall surrounding cells.
Hence, **Pollen Mother Cells.**

Chromosomes very much condensed, short, thick, constrictions not clear.
Hence, cells showing **Meiotic Division.**

1. A. Normal Meiotic Stages:

i) Absence of cell plate.
Hence, **Meiotic Division-I**

a. Chromosomes occur as bivalents, 8 bivalents countable with interstitial chiasmata, nucleolus distinctly visible.
Hence, **Diplotene sub-stage of Prophase-I Stage**

b. Chromosomes occur as bivalents, 8 bivalents countable with terminalized chiasmata intypical eye-shaped, y-shaped, x-shaped configurations, nucleolus not visible.
Hence, **Diakinesis sub-stage of Prophase-I Stage**

c. Nuclear membrane and nucleolus not visible, chromosomes occur as bivalents, 8 bivalents countable, arranged linearly at the equatorial region of the cell/ scattered.
Hence, **Metaphase-I Stage**

d. Nuclear membrane and nucleolus not visible, chromosomes arranged at the two poles, chromosomes visible, chromosomes V-shaped with arms towards equator.
Hence, **Anaphase-I Stage**

e. Nuclear membrane and nucleolus not visible, chromosomes arranged at the two poles, individual chromosomes not visible, chromosomes appear as smooth clumps.
Hence, **Telophase-I Stage**

ii) Presence of cell plate.
Hence, **Meiotic Division-II**

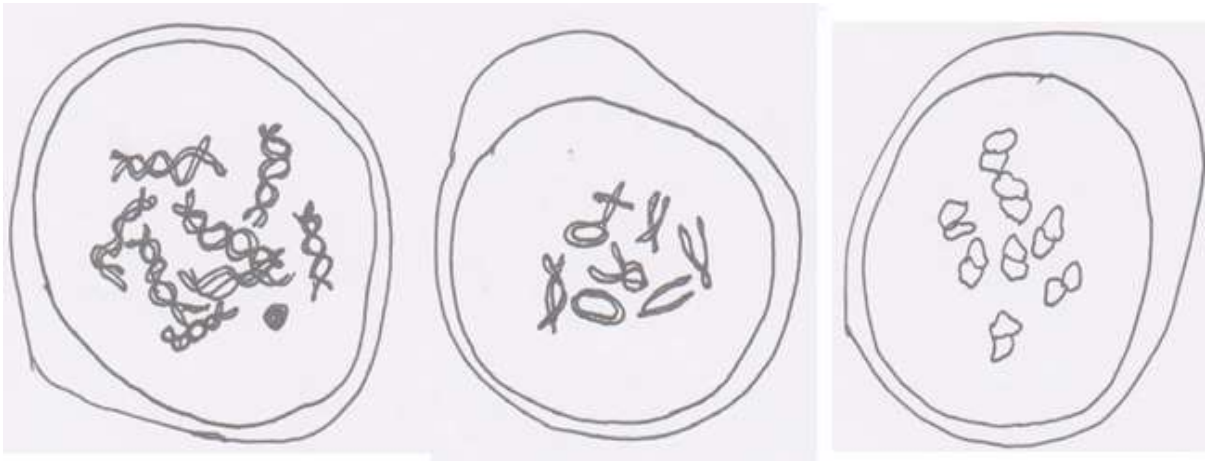
f. Nuclear membrane and nucleolus not visible, chromosomes appear as univalents, 8 univalents appear linearly arranged at the equatorial region/scattered in each cell.
Hence, **Metaphase-II Stage**

g. Nuclear membrane and nucleolus not visible, chromosomes arranged at the two poles, chromosomes visible, chromosomes V-shaped with arms towards equator.
Hence, **Anaphase-II Stage**

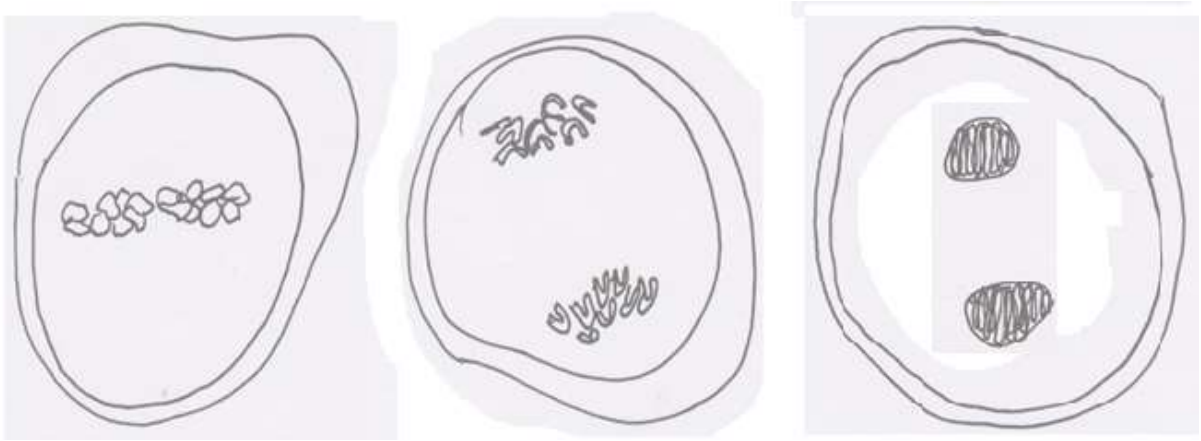
h. Nuclear membrane and nucleolus not visible, chromosomes arranged at the two poles, individual chromosomes not visible, chromosomes appear as smooth clumps.
Hence, **Telophase-II Stage**

Plant Cytology: Identification of Permanent Slides

1. A. Normal Meiotic Stages: Division I



[A] **[B]** **[C]**



[D] **[E]** **[F]**

[A] Diplotene sub-stage of Meiotic Prophase-I Stage
[B] Diakinesis sub-stage of Meiotic Prophase-I Stage
[C] Meiotic Metaphase-I Stage (Polar View)
[D] Meiotic Metaphase-I Stage (Side View)
[E] Meiotic Anaphase-I Stage
[F] Meiotic Telophase-I Stage

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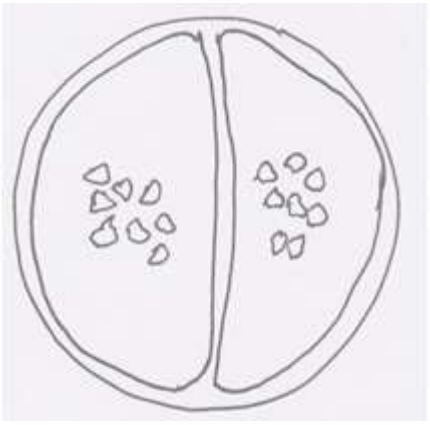
1. A. Normal Meiotic Stages: Division II



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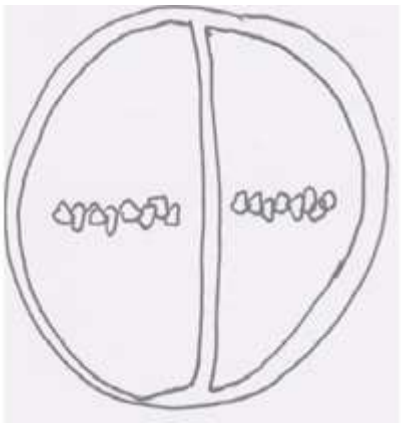

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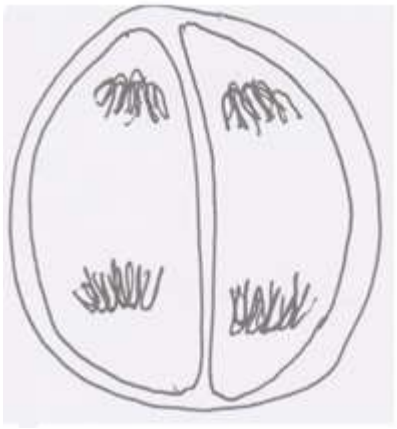


[C]

[D]

[A] Meiotic Metaphase-II Stage (Polar View)
[B] Meiotic Metaphase-II Stage (Side View)
[C] Meiotic Anaphase-II Stage
[D] Meiotic Telophase-II Stage

Plant Cytology: Identification of Permanent Slides

1. Meiotic Stages:

Cells loosely arranged.
Cells round/oval in outline.
Presence of thick callose wall surrounding cells.
Hence, **Pollen Mother Cells.**

Chromosomes very much condensed, short, thick, constrictions not clear.
Hence, cells showing **Meiotic Division.**

1. B. Abnormal Meiotic Stages:

Absence of cell plate.
Hence, **Meiotic Division-I**

i) Nuclear membrane and nucleolus not visible, chromosomes arranged at the two poles of the cell, individual chromosomes visible, chromosomes V-shaped, with arms towards equator.
Hence, **Anaphase-I Stage**

i. Bridge present between the two poles connecting the two groups of chromosomes.
Hence **Anaphase Bridge of Meiosis**

j. Two chromosomes are lagging behind while the rest have reached the two poles.
Hence, **Anaphase-I Stage with Laggards**

ii) Nuclear membrane and nucleolus not visible, chromosomes arranged at the two poles of the cell, individual chromosomes not visible, chromosomes appear as clumps with a smooth outline.
Hence **Telophase-I Stage**

k. Two chromosomes are lagging behind while the rest have reached the two poles.
Hence, **Telophase-I Stage with Laggards**

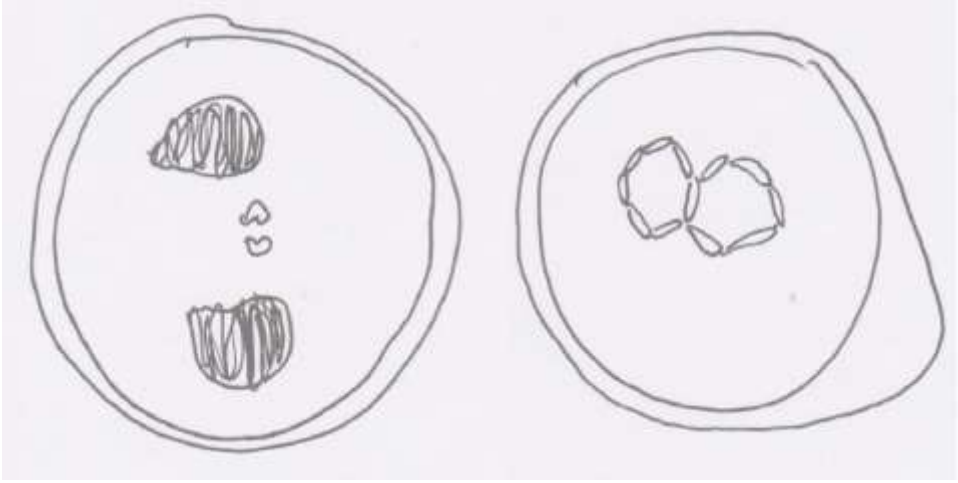
iii) Nuclear membrane and nucleolus not visible.
Chromosomes condensed.
Hence, **Metaphase-I Stage**

l. 12 chromosomes attached end to end forming a multivalent ring (formed due to reciprocal translocations between the chromosomes).
Hence, **Ring Chromosome of *Rhoeo***

Plant Cytology: Identification of Permanent Slides

1. B. Abnormal Meiotic Stages

[A] **[B]**



[C] **[D]**

[A] Anaphase Bridge of Meiosis
[B] Anaphase-I Stage with Laggards
[C] Telophase-I Stage with Laggards
[D] Ring Chromosome of *Rhoeo*

Plant Cytology: Identification of Permanent Slides

2. Mitotic Stages:

Cells loosely arranged.
Cells boat-shaped.
Presence of thick wall surrounding cells.
Hence, **Pollen Grains**

Chromosomes long, rod-like, with prominent constriction regions.
Hence, cells showing **Mitotic Division**

2. A. Normal Mitotic Stages:

m. Nuclear membrane and nucleolus absent, chromosomes distinctly long, rod-like with prominent primary constrictions, appear scattered in each cell and 8 in number.
Hence, **Pollen Mitosis at Metaphase Stage**

Or,

Mitotic Stages:
Cells compactly arranged.
Cells rectangular in outline.
Presence of thin wall surrounding cells.
Hence, **Somatic Cells.**

Chromosomes less condensed, long, slender, constrictions clear.
Hence, cells showing **Mitotic Division**

2. A. (ii) Normal Mitotic Stages:

n. Nucleolus absent, nuclear membrane partly present, chromatin material unwound but individual chromosomes not distinct.
Hence, **Prophase Stage**

o. Nucleolus and nuclear membrane absent, chromosomes distinctly rod-like with prominent primary constrictions and linearly arranged at the equatorial region/scattered in each cell.
Hence, **Metaphase Stage**

p. Nucleolus and nuclear membrane absent, chromosomes distinct and slender and arranged at the two poles of each cell, chromosomes V-shaped or L-shaped with arms towards the equator and constriction towards the poles.
Hence, **Anaphase Stage**

q. Nucleolus absent and nuclear membrane reappeared, chromosomes present as clumps with smooth outlines at the two poles of each cell, individual chromosomes not distinct.
Hence, **Telophase Stage**

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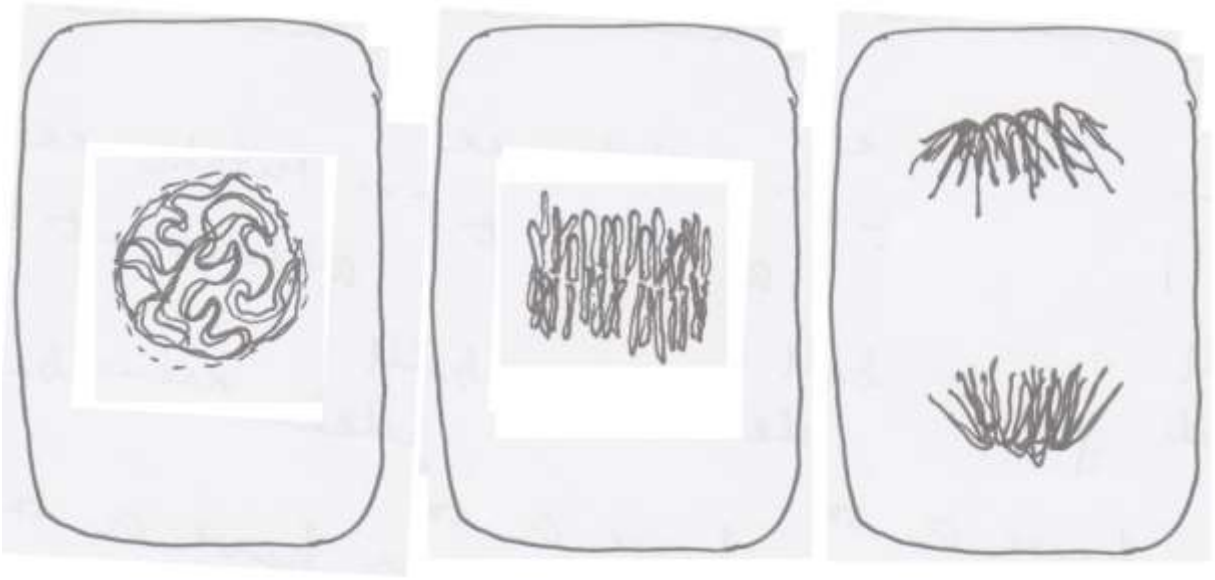
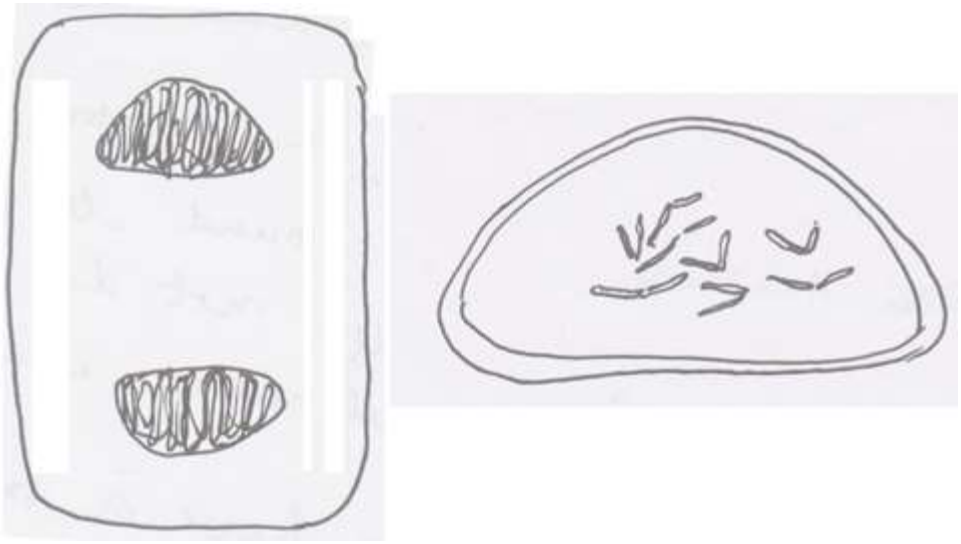
2. A. Normal Mitotic Stages



[A] **[B]** **[C]**



[D] **[E]**

[A] **Mitotic Prophase Stage**
[B] **Mitotic Metaphase Stage**
[C] **Mitotic Anaphase Stage**
[D] **Mitotic Telophase Stage**
[E] **Pollen Mitosis at Metaphase Stage**

Plant Cytology: Identification of Permanent Slides

2. Mitotic Stages:

Cells compactly arranged.
Cells rectangular in outline.
Presence of thin wall surrounding cells.
Hence, **Somatic Cells.**

Chromosomes less condensed, long, slender, constrictions clear.
Hence, cells showing **Mitotic Division**

2. B. Abnormal Mitotic Stages:

i) Chromosomes rod-like appearing scattered at the equatorial region of the cell.
Hence, **Mitotic Metaphase Stage**

r. A few chromosomes show breaks in their arms and have become fragmented.
Hence, **Fragmentation in Mitotic Metaphase Stage**

ii) Chromosomes V or L-shaped, arranged at the 2 poles of the cell with their arms towards the equator and primary constrictions towards the poles
Hence, **Mitotic Anaphase Stage**

s. A few chromosomes appear to have reached the poles due to early separation while the majority have not
Hence, **Early Separation during Mitotic Anaphase Stage**

t. A few chromosomes appear near to the equatorial region of the cell due to late separation while the majority have reached the poles
Hence, **Late Separation during Mitotic Anaphase Stage**

u. A bridge/few bridges present between the two poles connecting the two groups of chromosomes
Hence, **Sticky Bridge of Mitotic Anaphase Stage**

v. Chromosomes arranged at four distinct regions of the cell with their constrictions towards the four corners and arms towards the centre forming four poles
Hence **Multi-polarity of Mitotic Anaphase Stage**

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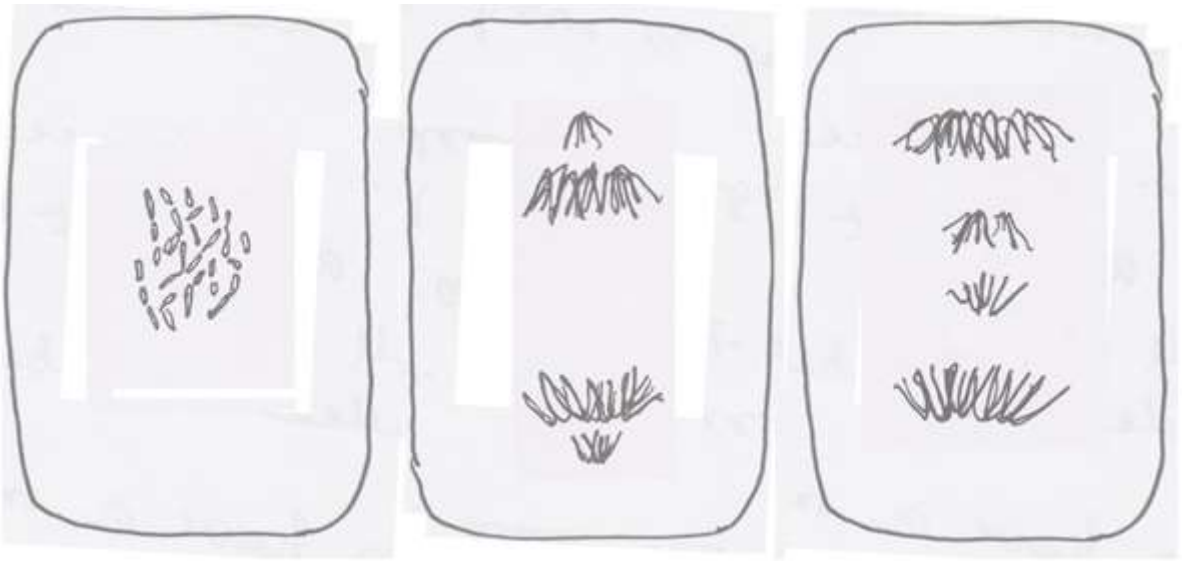
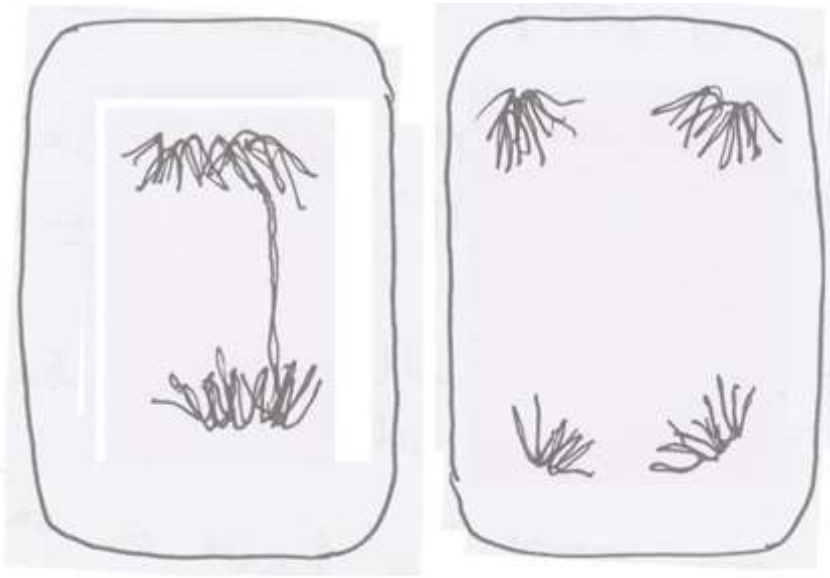
2. B. Abnormal Mitotic Stages



[A] **[B]** **[C]**



[D] **[E]**

[A] **Fragmentation in Mitotic Metaphase Stage**
[B] **Early Separation during Mitotic Anaphase Stage**
[C] **Late Separation during Mitotic Anaphase Stage**
[D] **Sticky Bridge of Mitotic Anaphase Stage**
[E] **Multi-polarity of Mitotic Anaphase Stage**