

“Dissemination of Education for Knowledge, Science and Culture”

-Shikshanmaharshi Dr. Bapuji Salunkhe

Shri Swami Vivekanand Shikshan Sanstha's

Vivekanand College, Kolhapur (An Empowered Autonomous Institute)

Department of Zoology

B.Sc. II Sem IV (Minor)

Academic Year 2025-26

Date: 20/12/2025

Notice

All students of **B.Sc. II Minor** are hereby informed that the **Open Book Test** for the paper Tools and Techniques in Biology is scheduled on 23/12/2025. Attendance is compulsory for all.



Ms. P. R. Gaikwad

Teacher Incharge



Dr. G. K. Sontakke

Head

Department of Zoology
Vivekanand College Kolhapur
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Academic Year 2025-26

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B.Sc. II Sem IV (Minor)

Paper- Tools and Techniques in Biology

Question Paper

Question: What is Electron microscope? Explain its working and types.

10M



Ms. P. R. Gaikwad

Teacher Incharge

Date : 23/12/2025

B.Sc. II Sem IV (Minor)

Paper- Tools and Techniques in Biology

Attendance

Sr. No.	Roll No.	Name of the student	Signature
1.	7910	Samruddhi Vijay Shinde	S.V. Shinde
2.	7905	sheeya Sunil Patil	Patil
3.	7897	sanika Tanaji chougule	Chougule
4.	7902	Siya kailas More	More
5.	7900	Pratiksha Prashant Kulkarni	Kulkarni
6.	7911	Pranali Mhalappa Vhanmare	Vhanmare
7.	7903	Asiya Dastgir Nadaf	Asiyi.
8.	7907	Tasneem Bhola Nadaf Pinjari	T.B. Nadaf.
9.	7959	Madhusima Vijay Patil	Patil
10.	7961	Vaidali A. Patil	Patil
11.	7953	Madalasa R. Kumbhar.	MRK.
12.	7954	Anshu S. Kulkane	A.S.K
13.	7952	Gauri Suresh Kumbhar	GKumbhar
14.	7904	Sanjivani Vishnu Patil.	Patil
15.	7963	Rutuja Suresh Wandre	Rutuja
16.	7895	Pradnya Vijay Parit	Parit.
17.	7893	Pradnya Shankar mohite.	P.S. mohite.
18.			
19.			
20.			
21.			
22.			

P. R. Gaikwad

Ms. P. R. Gaikwad
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G. K. Sontakke

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Academic Year 2025-26

B.Sc. II Sem IV (Minor)
Paper- Tools and Techniques in Biology
Marksheet

Sr. No.	Roll. No.	Name of the student	Mark out of 10
1.	7893	Mohite Pradnya Shankar	08
2.	7895	Parit Pradnya Vijay	09
3.	7897	Chougule Sanika Tanaji	09
4.	7900	Kulkarni Pratiksha Prashant	09
5.	7902	More Siya Kailash	09
6.	7903	Nadaf Asiya Dastgir	10
7.	7904	Patil Sanjivani Vishnu	08
8.	7905	Patil Shreya Sunil	08
9.	7907	Pinjari Tasneem Bhola Nadaf	10
10.	7910	Shinde Samruddhi Vijay	10
11.	7911	Vhanmane Pranali Mhalappa	10
12.	7952	Kumbhar Gauri Suresh	07
13.	7953	Kumbhar Madalasa Rukmangat	09
14.	7954	Kurane Anshu Shivaji	09
15.	7959	Patil Madhurima Vijay	08
16.	7961	Patole Vaidehi Arun	10
17.	7963	Wandre Rutuja Suresh	09


Ms. P. R. Gaikwad
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Name : Asiya pastgir Nadaf.

Roll No. 7903

sub. Zoology

What is Electron Microscope ? Explain it's working & types.

→ An electron microscope is a microscope that uses a beam of accelerated electrons as a source of illumination.

It is special type of microscope with a high image resolution & can magnify objects in ~~nanometres~~ nanometres.

Working -

1. The electron gun generates the electrons.
 2. Two sets of condenser lenses focus the electron beam on specimen.
 3. To move electrons down the column, an accelerating voltage (mostly betⁿ 20 kv - 1000 kv) is applied betⁿ the tungsten filament & anode.
 4. The specimen to be examined is made extremely thin, at least 200 times thinner than those used in the optical microscope. Ultra-thin sections of 20-100 nm are cut which is already placed on the specimen holder.
- ⊗ The electron beam coming out of the specimen passes to the objective lens, which has high powered power & forms the intermediate magnified image.

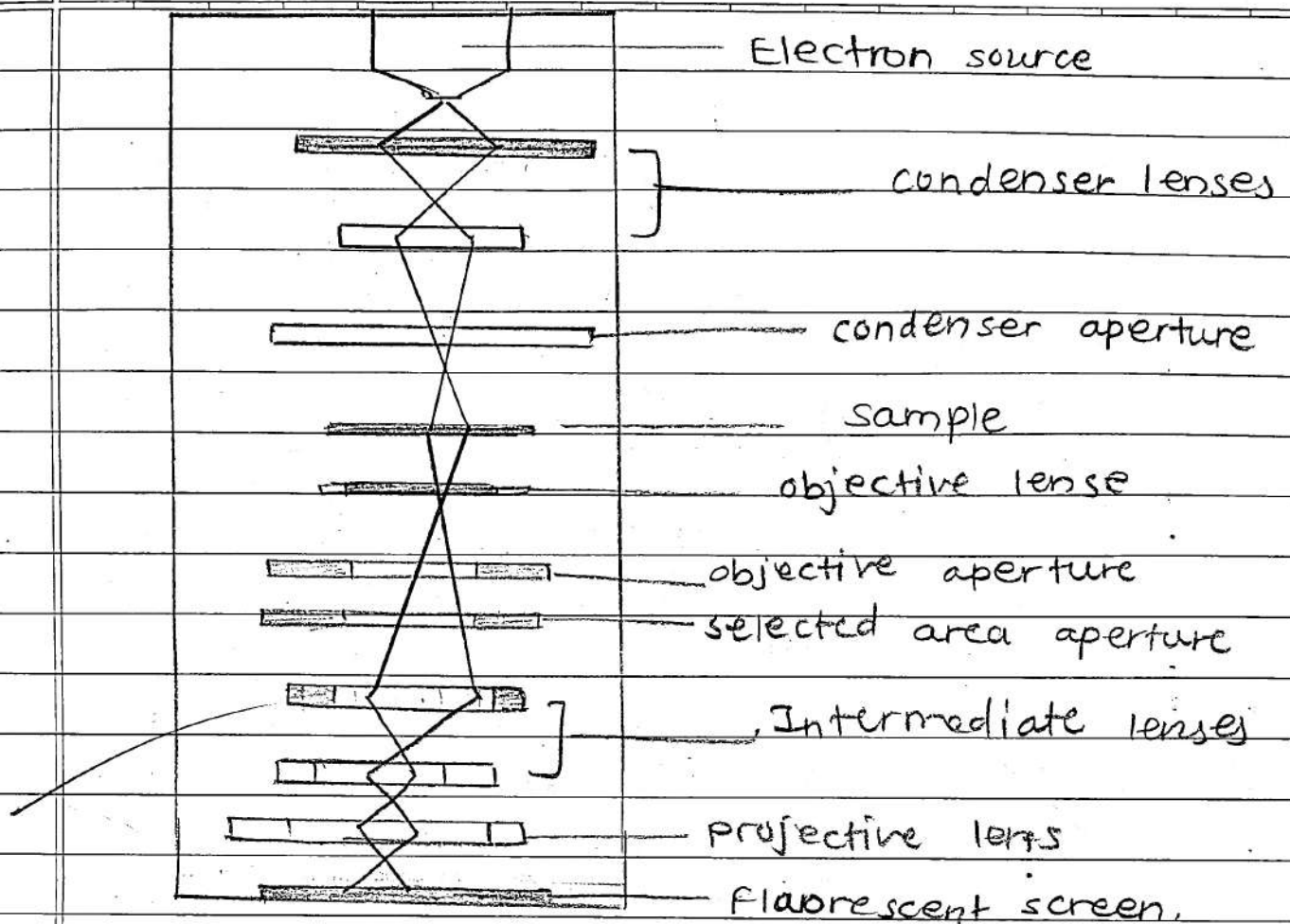
5. The electron beam passes through the specimen & electrons are scattered depending upon the thickness of different parts of specimen.
6. The denser regions in the specimen scatter more electrons & therefore appears darker in image since fewer electrons strike that area of screen. In contrast, transparent regions are brighter.
7. The electron beam coming out of specimen passes to objective lens, which has high power & forms the intermediate magnified image.
8. The ocular lenses then produce the final further magnified image.

- There are 2 types of electron microscope.

- 1) Transmission electron microscope (TEM)
- 2) scanning electron microscope (SEM)

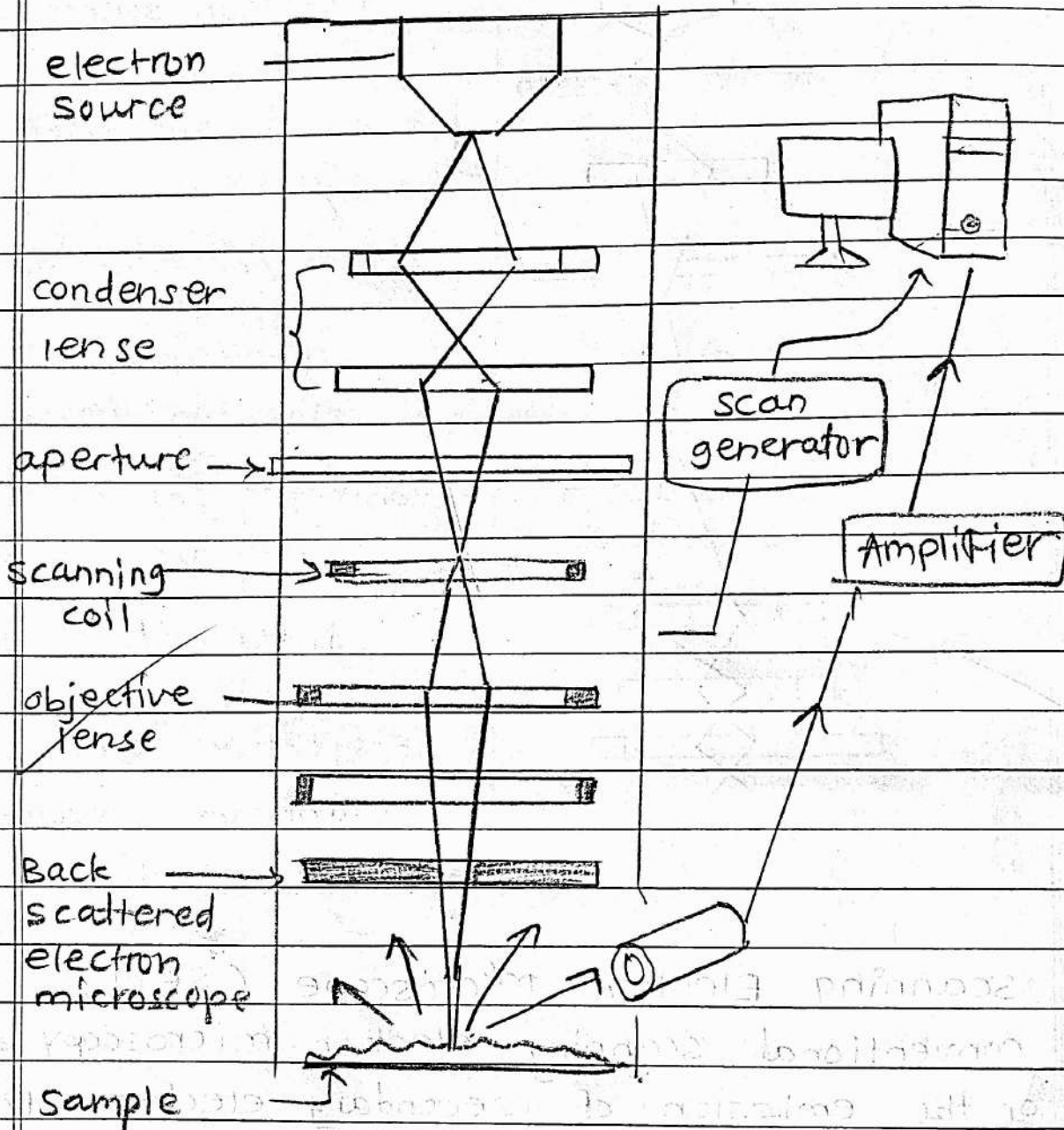
1) Transmission electron microscope (TEM)

- This is used to view thin specimens through which electron can pass, generating a projection image.
- The TEM is analogous in many ways to conventional light microscope.
- TEM is used, among other things, to image the interior of cells, the structure of protein molecules, the organization of molecules in viruses, the arrangement of protein molecules in cell membranes.



2) Scanning Electron Microscope (SEM)

- conventional scanning electron microscopy depends on the emission of secondary electrons from the surface of a specimen.
- Because of its great depth of focus, a scanning electron microscope is analog of stereo light microscope.
- It provides detailed images of surfaces of cell & whole organisms. It also be used for particle counting & size determination, & for process control.
- It is termed a scanning electron microscope because the image is formed by scanning a focused electron beam onto surface of specimen



Q:1 What is electron microscope. Explain its working & its types.

→ Electron microscope is a microscope that uses a beam of accelerated electrons as a source of illumination.

It is a special type of microscope with a high image resolution and can magnify objects in nanometers.

Parts of Electron Microscope

- It is in the form of a tall vacuum column that is vertically mounted. It has following components :-

1] Electron gun

2] Electromagnetic lenses

- condenser lens

- objective lens

- projector lens

3] Specimen holder

4] Image viewing and Recording system.

① Electron gun is heated tungsten filament, which generates electrons.

② Electromagnetic lenses -

• Condenser lens focuses the electron beam on specimen.

• Objective lens passes when electron beam coming out of specimen the second of magnetic coils.

• Projector lens is third set of magnetic lens produces final further magnified image.

③ Specimen holder is extremely thin film of carbon held by a metal grid.

④ Image viewing is final image projected on a fluorescent screen.

Working / Principle -

1. The electron gun generates electrons.
2. Two sets of condenser lenses focus the electron beam on specimen.
3. To move e^- down the column an accelerating voltage is applied betⁿ the tungsten filament & anode. (20 KV - 10000 KV)
4. Specimen is examined is made extremely thin, at least 200 times thinner than those used in optical microscope.
5. Electronic beam passes through specimen & e^- are scattered depending on thickness.
6. Denser regions in specimen scatter more e^- .
7. e^- beam coming out of specimen passes objective lens.
8. Ocular lens produce the final further magnified image.

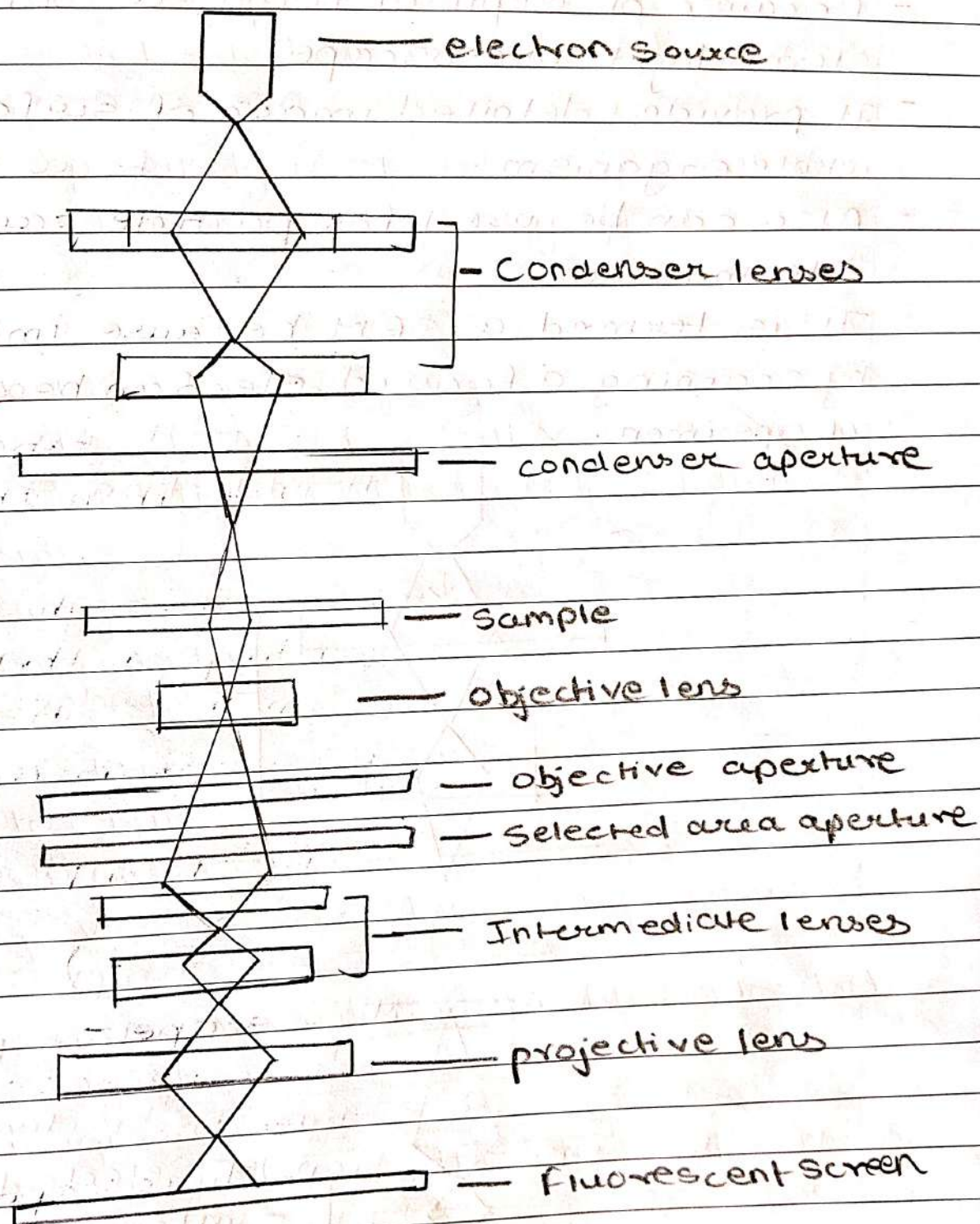
Types of Electron Microscope -

- There are 2 types of e^- microscope with different operating styles.

① Transmission Electron Microscope (TEM)

- This microscope is used to view thin specimens through which e^- can pass, generating a projection image.
- TEM is analogous in many ways to conventional light microscope.

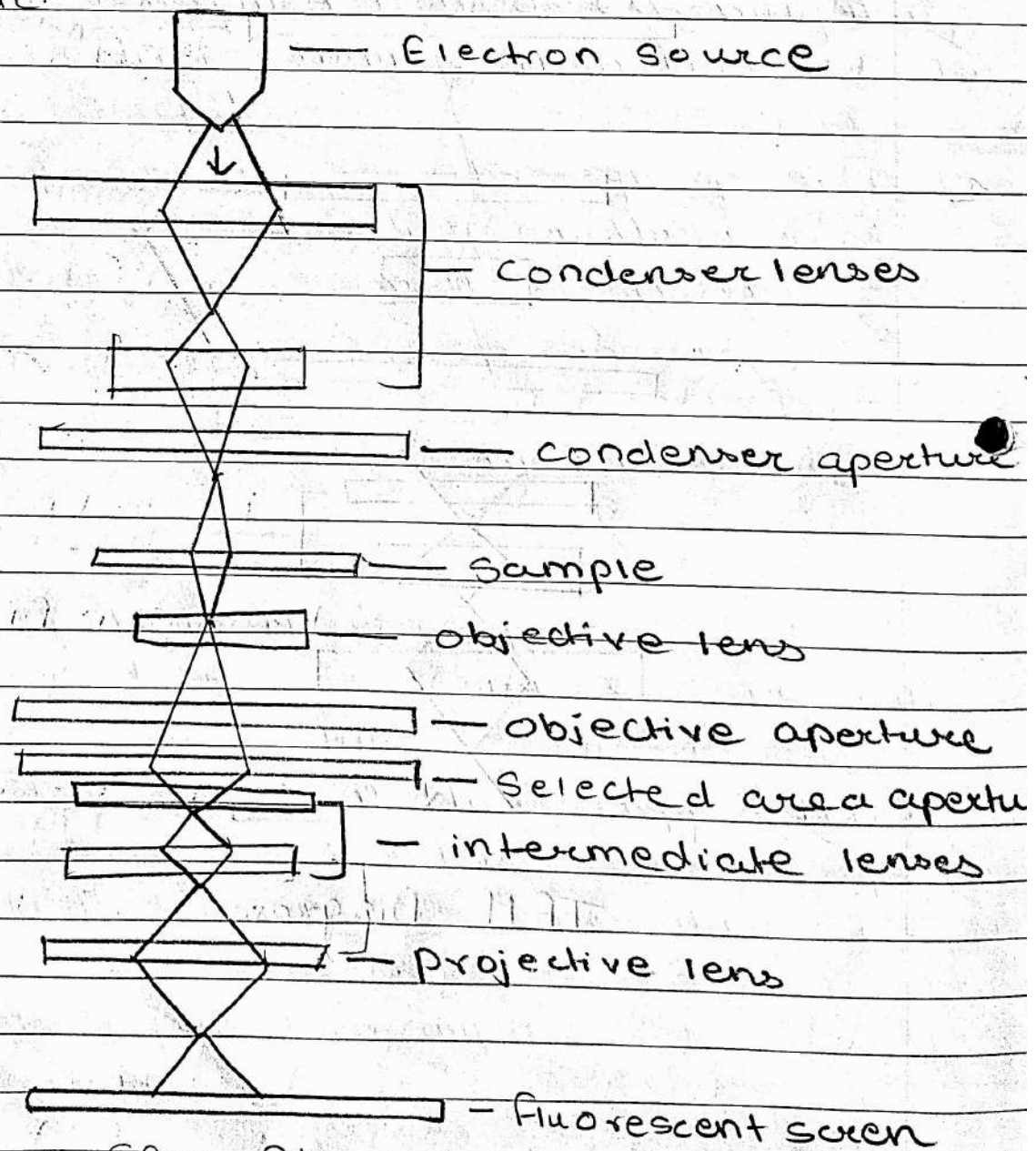
- TEM is used, among other things to image the interior of cells.
- The structure of protein, viruses in cell membrane is observed.



TEM Diagram.

② Scanning Electron Microscope (SEM)

- It is conventional microscope depending on emission of secondary e^- from surface of specimen.
- Because of depth of focus, a SEM is analog of stereo light microscope.
- It provides detailed image of surface of cells & whole organism.
- Also can be used for particle counting & size determination.
- It is termed a SEM because image is formed by scanning a focused electron beam onto surface of specimen.



SEM Diagram.