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4th class
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(5)

Microtome

microtome :- is a device used to cut extremely thin slices of material, known as sections. Important in science.

- Microtomes are used in microscopy, allowing for the preparation of samples for observation under transmitted light or electron radiation.

➢ Microtomes use steel, glass, or diamond blades. depending upon.

1) the specimen being sliced.
2) the desired thickness of the sections being cut.

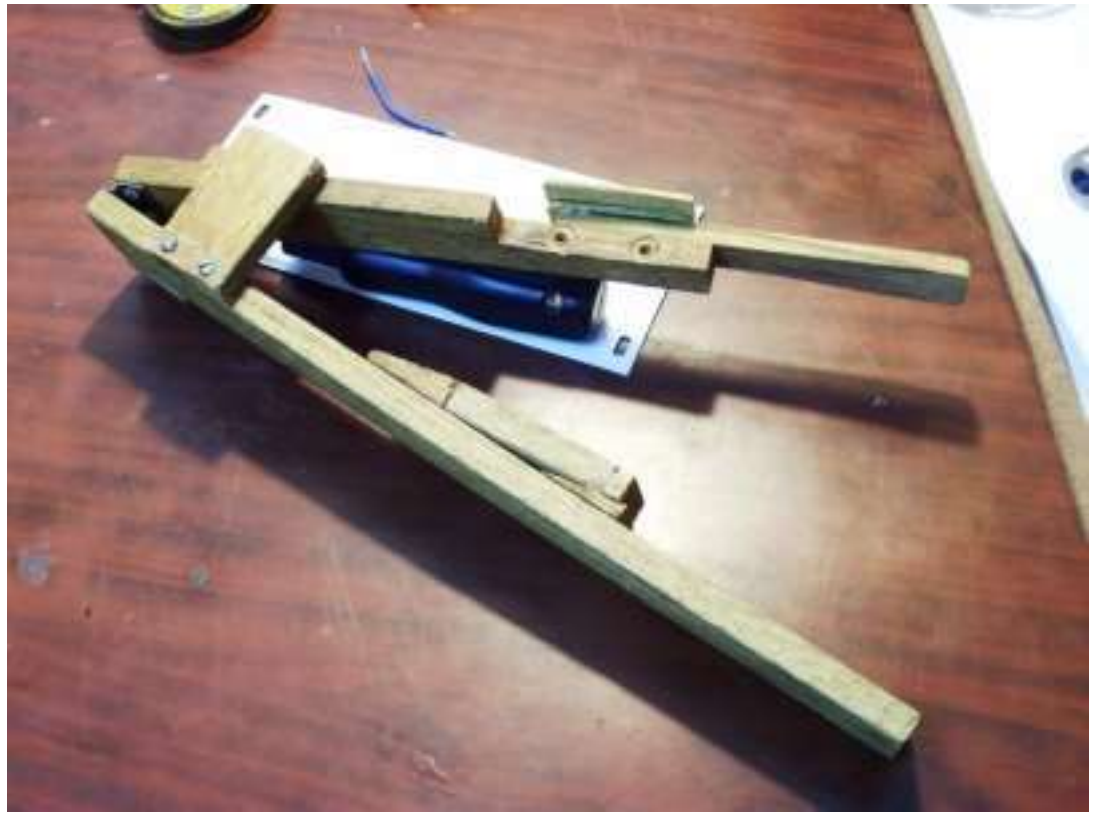
Types of Blades

1. Steel blades are used to prepare sections of animal or plant tissues for light microscopy histology.
2. Glass knives are used to slice sections for light microscopy and to slice very thin sections for electron microscopy.
3. Diamond knives are used to slice hard materials such as bone, teeth and plant matter for both light microscopy and for electron microscopy.

Microtomy used to prepare a thin sections for materials such as bones, minerals and teeth. Microtome sections can be made thin enough to section a human hair across its breadth, with section thickness between 50 nm and 100 µm.

History

The earliest form of microtomy was the freehand sectioning of fresh or fixed material using a sharp razor. The section produced, could, with practice, be quite thin and translucent.



Types of microtomes

Based on the mechanism:

1. Rocking
2. Rotary Rocking
3. Sledge microtome
4. Rotary microtome
5. Cryomicrotome
6. Ultramicrotome
7. Vibrating microtome
8. Saw microtome
9. Laser microtome

1) Rocking microtome

2) Rotary rocking microtome

Main Types of Microtomes

3) Sledge microtome

Typical applications for this design of microtome are of the preparation of large samples, such as those embedded in paraffin for biological preparations. Typical cut thickness achievable on a sledge microtome is between 1 and 60 µm.

sledge microtome

4. Rotary microtome

The typical cut thickness for a rotary microtome is between 1 and 60 µm. For hard materials, such as a sample embedded in a synthetic resin, this design of microtome can allow good "semi-thin" sections with a thickness of as low as 0.5 µm

5. Cryomicrotome

For the cutting of frozen samples, many rotary microtomes can be adapted to cut in a liquid-nitrogen chamber, in a so-called cryomicrotome setup.
The reduced temperature allows the hardness of the sample to be increased, such as by undergoing a glass transition, which allows the preparation of semi-thin samples.
However the sample temperature and the knife temperature must be controlled in order to optimise the resultant sample thickness.

6. Ultramicrotome

It allows the preparation of extremely thin sections

The typical thickness of these cuts is between 40 and 100 nm for transmission electron microscopy

Diamond knives (preferably) and glass knives are used with ultramicrotomes. To collect the sections, they are floated on top of a liquid as they are cut and are carefully picked up onto grids suitable for TEM specimen viewing

7. Vibrating microtome

- The vibrating microtome operates by cutting using a vibrating blade, allowing the resultant cut to be made with less pressure than would be required for a stationary blade.
- The vibrating microtome is usually used for difficult biological samples.
- The cut thickness is usually around 30–500 µm for live tissue and 10–500 µm for fixed tissue.

8. Saw microtome

- The saw microtome is especially for hard materials such as teeth or bones.
- The microtome of this type has a recessed rotating saw, which slices through the sample.
- The minimal cut thickness is approximately 30 µm and can be made for comparatively large samples.

9. Laser microtome

- Contact free slicing
- Prior preparation of sample not required
- Can also be used for very hard materials, such as bones or teeth as well as some ceramics
- Thickness: 10-100 µm