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\* Biomedical engineering assignment

\* THE LIGHT MICROSCOPE

\* A light microscope is a laboratory instrument or tool, that uses visible light to detect and magnify very small objects,enlarging them.

\* They use lenses to focus light on the specimen, magnifying it thus producing an image. The specimen is normally placed close to the microscopic lens.

\* Microscopic magnification varies greatly depending on the types and number of lenses that make up the microscope. Depending on the number of lenses, there are two types of microscopes i. e 1-Simple light microscope (it has low magnification because it uses a single lens) and 2-the Compound light microscope (it has a higher magnification compared to the simple microscope because it uses at least two sets of lenses, an objective lens, and an eyepiece). The lenses are aligned in that, they can be able to bend light for efficient magnification of the image.

\* The functioning of the light microscope is based on its ability to focus a beam of light through a specimen, which is very small and transparent, to produce an image. The image is then passed through one or two lenses for magnification for viewing. The transparency of the specimen allows easy and quick penetration of light. Specimens can vary from bacterial to cells and other microbial particles.

The object is placed on a stage and may be directly viewed through one or two eyepieces on the microscope. In high-power microscopes, both eyepieces typically show the same image, but with a stereo microscope, slightly different images are used to create a 3-D effect. A camera is typically used to capture the image (micrograph).

The sample can be lit in a variety of ways. Transparent objects can be lit from below and solid objects can be lit with light coming through (bright field) or around the objective lens (dark field). Polarised light may be used to determine crystal orientation of metallic objects. Phase-contrast imaging can be used to increase image contrast by highlighting small details of differing refractive index.

A range of objective lenses with different magnification are usually provided mounted on a turret, allowing them to be rotated into place and providing an ability to zoom-in. The maximum magnification power of optical microscopes is typically limited to around 1000x because of the limited resolving power of visible light. The magnification of a compound optical microscope is the product of the magnification of the eyepiece (say 10x) and the objective lens (say 100x), to give a total magnification of 1,000×. Modified environments such as the use of oil or ultraviolet light can increase the magnification.

CENTRIFUGE

PRINCIPLES OF A CENTRIFUGE

\* In a solution, particles whose density is higher than that of the solvent sink (sediment), and particles that are lighter than it floats to the top.

\* The greater the difference in density, the faster they move. If there is no difference in density (isopycnic conditions), the particles stay steady.

\* To take advantage of even tiny differences in density to separate various particles in a solution, gravity can be replaced with the much more powerful “centrifugal force” provided by a centrifuge.

\* A centrifuge is a piece of equipment that puts an object in rotation around a fixed axis (spins it in a circle), applying a potentially strong force perpendicular to the axis of spin (outward).

\* The centrifuge works using the sedimentation principle, where the centripetal acceleration causes denser substances and particles to move outward in the radial direction.

\* At the same time, objects that are less dense are displaced and move to the center.

\* In a laboratory centrifuge that uses sample tubes, the radial acceleration causes denser particles to settle to the bottom of the tube, while low- density substances rise to the top.

MAINTENANCE AND CARE FOR A CENTRIFUGE

\* Clean the centrifuge daily, or at least weekly.

\* Remove the rotor and any sample or container holders.

\* Interior cleaning includes the interior bucket, specimen holder, rotor and supports.

\* Use a sponge, warm water and a mild detergent such as dishwashing liquid.

\* Do not use caustic detergents or any product containing chlorine ions. (Diluted bleach is sometimes used as a disinfectant, but at full strength can attack stainless steel and discolor or damage the bowl (see below). A plastic scrub pad can be used, but products such as steel wool, wire brushes and other abrasives can damage coatings and lead to corrosion.

\* Spills should be wiped up immediately.

\* Clean both the exterior and the interior.

\* Do not pour water directly into the chamber or flood the inside of the centrifuge with cleaner. Sensors, gaskets, seals, wiring and other parts that may be present can be easily damaged. Motors, vacuum pumps, condensers and other expensive parts can also be damaged by exposure to water and cleaning products.

\* Scrub tube cavities with a test tube brush with nonmetallic tip. Dry each part with an absorbent towel.

\* Always place the centrifuge on a flat surface first.

\* Always unplug the power cord before cleaning.

\* Wear disposable gloves.

\* Follow your facility’s safety procedures when cleaning and disinfecting the centrifuge.

\* Before moving the centrifuge to a new location, the exterior and interior surfaces should be cleaned and disinfected.

\* Plug in centrifuge only when completely dry.

DISINFECTION AND DECONTAMINATION

Disinfect on a regular basis. Approved disinfectants and/or “spill kits” should be used. A 10% bleach solution (one part bleach to nine parts water) can be used with some materials: consult manual. After cleaning with a bleach dilution, dispose of any remaining mix.

Spills of radioactive substances can often be addressed with a decontamination solution of 70% ethanol and 10% sodium dodecyl sulfate in water. Parts will need to be rinsed with ethanol first, and the following decontamination, with deionized water. Appropriate protective gear should be worn and properly disposed of after use.

BRAND AND COST OF CENTRIFUGE

MINICEN

MICROCEN

DIGICEN

BIOPROCEN

BIOCEN etc.

AUTOMATIC TISSUE PROCESSOR

PRINCIPLE AND BRAND

Most ATPMs are easy-to-program interface. The Leica processor model has ten 1.8L (60.9oz.) reagent beakers and two 1.8L (60.9oz.) wax baths.

The tissue basket oscillates up and down in each station at three-second intervals to ensure thorough and even mixing of the reagents and optimum tissue infiltration.

Infiltration time is separately programmable for each station. Up to nine programs may be run with immediate or delayed starting times.

When it’s time for tissue to be transferred to the next beaker or jar, the cover of the machine is raised up, and the lifting mechanism carefully removes the tissue basket and gently transfers it to the next beaker.

When the infiltration time for any particular station is exceeded, a warning message will display, indicating the station number and excess time. Controls are arranged by functionality with an LCD to indicate operational parameters. Reagent container lids have seals to minimize operator exposure to hazardous fumes.

Tissue basket immediately immerses in a station in the event of power loss to protect samples from drying out. When power is restored, program will resume. In the event of long-term power failure, wax is liquified. Capacity of tissue basket is 80 cassettes.

Vacuum configurations hasten infiltration, allowing pressure to be applied to any station in either manual or automatic operation. Fume control configurations extract fumes with a fan and pass them through an internal carbon filter.

For added efficiency, these models feature a two-part containment shield surrounding the reagent container platform.

MAINTENANCE AND CARE

 1. Clean the instrument on a daily.

 2. Mop up spilled reagents immediately.

 3. Preventive maintenance should be done once a year.

4. Switch off when not in use.

5. Change reagents when necessary.

BRANDS AND COST

KEEDEE Automatic tissue processor: USD 12,800

Leica ASP300 tissue processor: USD 10,000

MICROTOME

PRINCIPLE

    microtome is a sectioning instrument that allows the cutting of extremely thin slices of a material known as section . microtome are used in microscopy , allowing for the preparation of sample for observation under transmitted light or electrons radiation . it is a method for the preparation of thin section for materials such as bones, minerals, and teeth.

   Microtome is a common instrument . this device operates with a staged rotary action such that the cutting is part of the rotary motion . in a rotary microtome ,blade is fixed in horizontal position . through the motion of the sample holder, the sample is cut by the knife position , at which point the fresh section remains on the knifes , at the highest point of the rotary motion , the sample holders is advanced by the same thickness as the section that is to be made , allowing for the next section to be made.

The flywheel is many microtomes can be operated by hands . this has the advantages that clean cut be made , as the  relatively large mass of the fly wheel prevents the sample from being stopped during the sample cut. It cuts thickness between 1 and 60 micron meter. For hard material , its cits a semi thin section with a thickness of as low as .5 micron meter.

MAINTENANCE AND CARE

 A. Do not leave the microtome unattended with an exposed knife/blade in position.

 Remove the knife/blade, or cover with the guards or visor provided.

 B. Do not leave unboxed knives/blades lying around. Place knives/blades that are not

 in use in their boxes or packets.

 C. Do not carry knives/blades unless secure in the box or packet provided.

 D. Do not clean the knife/blade along its length. Wipe the knife/blade from the back

 edge to the cutting edge.

 E. Remember that even used knives and blades are dangerous. They are still sharp

 and may have been used to cut potentially infectious specimens.

 F. Dispose of used knives and blades with the same care as other sharp objects. On

 no account should used knives or blades be placed in waste bins.

 G. Clean microtome after every use. Always cover after use to protect from dust/liquid.

BRANDS AND COSTS

1- Biophase microtome: USD 2,000- 6000

2- My-B 120 rotary microtome: USD 3,900- 4100

3- AMIS laboratory manual rotary hand microtome : USD 1,900- 2,100.