MICROSCOPE BUYING GUIDE

Inspiring tomorrow's scientists through practical science

TIMSTAR

Part of WF Education Group

INTRODUCTION

Microscopes are highly important pieces of equipment, and are one of the most influential scientific inventions ever made. The invention of the microscope opened up a new world of discovery and study of the smallest things.

Microscopes have played a huge part in science and, as they are configured to suit different applications, it is important to ensure that you purchase a microscope that is well-suited to your application.

This guide has been produced to assist you with the things that you should consider when buying a microscope.

MAIN FEATURES

of a typical compound microscope

Base

This normally contains the illumination system.

Condenser

The condenser consists of a lens (or set of lenses) that focuses the light onto the specimen. There are different types of condenser:

- A **stage condenser** is incorporated in the stage. It has a numerical aperture (NA) of 0.65 and is suitable for working with magnifications of 400x and lower.
- An **Abbe condenser** is under the stage and is able to focus light. Its NA is 1.25 and it is essential for working with magnifications of 1000x.

Diaphragm

This controls the amount of light to the specimen. There are two main types of diaphragm used in microscopes:

- A **rotating disc diaphragm** is a disc that is mounted just under the stage and contains a series of holes that get progressively smaller, and the disc is rotated to vary the amount of light.
- An **iris or aperture diaphragm** is used with an Abbe condenser and is operated with a lever that opens or closes a number of interconnected leaves, much like the iris in your eye controlling the size of the pupil. This allows many more settings than a disc-type diaphragm.

MAIN FEATURES

of a typical compound microscope

Eyepiece

A primary image is formed by the objective lenses; the eyepiece forms a secondary image, which is what you view. Two types of eyepieces are commonly available:

- **Wide field** – large field of view
- **Huygenian** – narrow field of view

Graticules (Which you can use to measure cell size) can be fitted to appropriate eyepieces. The eyepieces fit onto the eyepiece tube or ocular tube.

Eyepiece graticule & holder: MI10443
Complete eyepiece with graticule: MI74145
Glass eyepiece graticule: MI10700
Plastic eyepiece graticules: MI84165

Field of view

This is the area that is seen through the eyepiece when the microscope is in focus.

Head (turret)

This is the assembly that holds the eyepiece(s). This may be monocular, tutor, binocular or trinocular. The head is capable of rotating through 360°.

Focusing

The focus changes at what depth the sample is in focus. Coarse adjustment allows you to quickly find the approximate required focal depth through the focal plane. Fine adjustment then allows precise control to find the exact depth of interest. There are two types of focusing mechanism:

- **Rack and pinion** – separate coarse and fine focusing controls.
- **Coaxial** – comprising both the coarse and fine focusing controls around a common axis.

MAIN FEATURES

of a typical compound microscope

Illumination

Illumination can be provided in several ways:

Mirror: a plano-concave mirror situated on the base collects natural light or light from a lamp, which is then adjusted to give the best illumination through the specimen.

Bulb: tungsten, halogen or LED.
Tungsten illumination runs off the mains, so must be plugged in. It produces a yellowish light and a lot of heat, so is not suitable for viewing live specimens such as daphnia.

Halogen illumination also runs off the mains, so must be plugged in. It produces a very bright, white light and is usually fitted with an intensity control to reduce the amount of heat produced.

LED illumination is the latest technology. It produces a good white light that is cool, it uses very little power, and a bulb typically lasts 20,000 hours. If used in conjunction with a rechargeable battery system, it creates a cordless microscope.

Magnification

Total magnification is the eyepiece magnification multiplied by the objective magnification.

Numerical aperture (NA)

Applies to objectives and condensers. It allows the microscope to gather light and to resolve fine specimen detail while working at a fixed object distance.

Nosepiece

The nosepiece is the housing unit for the objective lenses. It rotates the objectives, which provide the view of the specimen. The user can select the objective they want to use by spinning the rotating nosepiece. A nosepiece may hold three or more objectives.

Objective lenses

The main objective lenses are 4x, 10x, 40x (spring-loaded) retractable and 100x (oil immersion) retractable. Objective lenses will be engraved with magnification, numerical aperture, tube length and cover slip acceptable thickness.

MAIN FEATURES

of a typical compound microscope

Objective lens types

These consist of several lenses that magnify an object. Achromatic objectives are standard objectives and are the most widely used. Others are improvements – for example, ASC (Achromatic Superior Contrast) or plan Achromatic, which provide a better resolution and tend to be used for more detailed observations. The terms refer to optical correction.

Oil immersion objective

The 100x objective is lowered into a drop of immersion oil placed on the slide. Oil immersion lenses should be used in conjunction with an Abbe condenser. The oil is the same refractive index as the objective lens and cover slip.

Retractable objective

A high-power objective lens is spring-loaded and will retract, protecting the prepared slide from damage.

Slip clutch

The slip clutch prevents the gears being damaged if you try to rack further than the normal stop position.

Stage

This is the flat, black table where the prepared slide is held in place by the stage clips. An adjustable stage stop protects slides and the microscope.

Mechanical stage

A mechanical stage MI10445 may be fitted or supplied with the microscope and retains the prepared slide. Mechanical movement allows the slide to be manipulated in 'x' and 'y' directions and is extremely useful when locating individual cells on a slide.

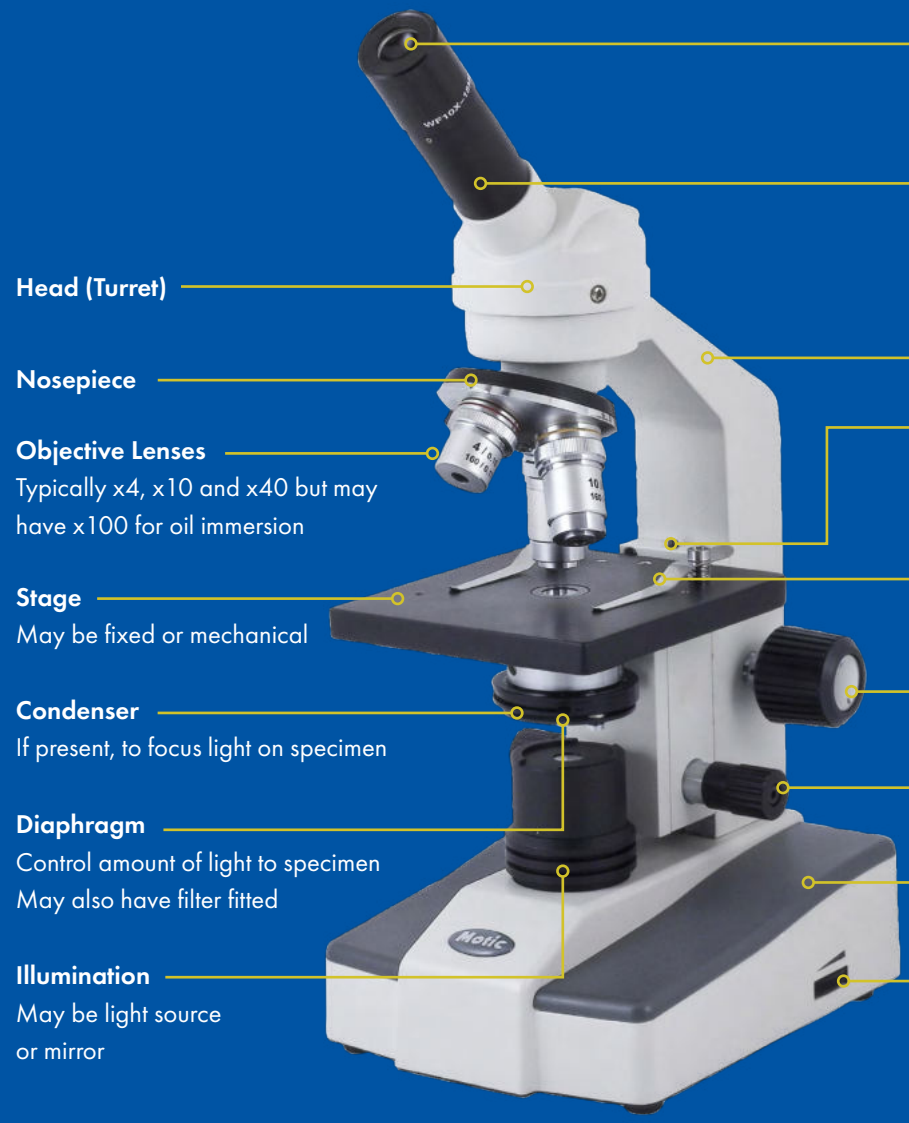
Stage clips

These are the clips that hold the slide in place on the stage.

ANNOTATED DIAGRAM OF A 'TYPICAL' MICROSCOPE

Browse our extensive range of microscopes online

Browse the range



Eyepiece
Typically x10 widefield magnification

Eyepiece Tube

Head (Turret)

Arm

Nosepiece

Stage Stop
If Present, located at rear of stage

Objective Lenses
Typically x4, x10 and x40 but may have x100 for oil immersion

Stage Clip
Holds slide in place

Stage
May be fixed or mechanical

Coarse Focus Adjustment

Condenser
If present, to focus light on specimen

Fine Focus Adjustment

Diaphragm
Control amount of light to specimen
May also have filter fitted

Base

Illumination
May be light source or mirror

Light Intensity Control

COMPOUND VS. STEREO MICROSCOPE

MI180200 - compound microscope

MI10552 - stereo microscope

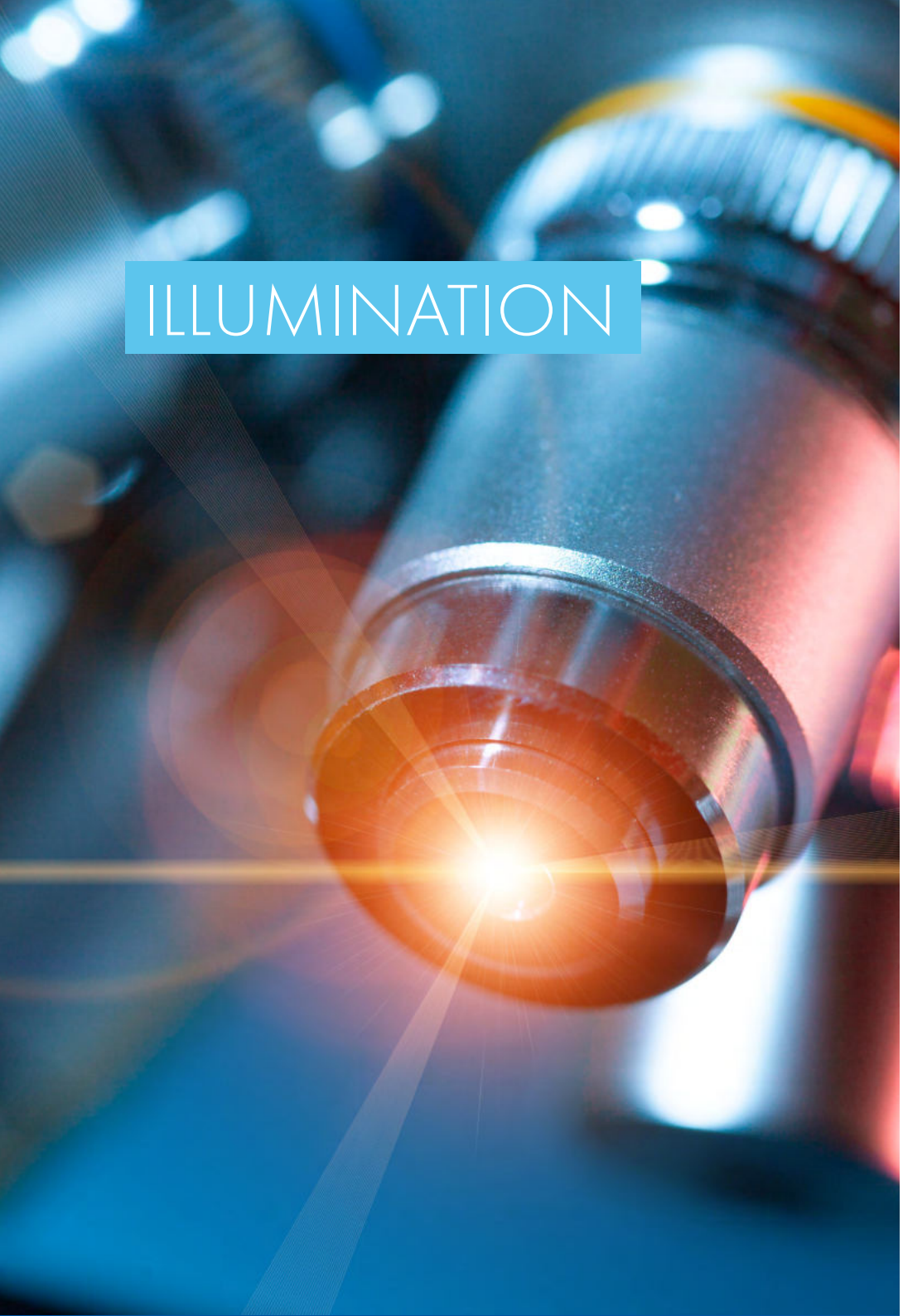
Compound microscope

A compound microscope provides an inverted but much greater magnification and the depth of field is small and there is no 3D view. It is designed for high magnification of smaller objects between 40x and 1000x. This type allows viewing of smaller subjects, such as algae, protozoa, insect parts, cells, and plant and animal sections. A compound microscope is required for viewing prepared slides.

- **Monocular microscopes** feature a single eyepiece, typically a 10x widefield magnification.
- **Binocular microscopes** allow the comfort of using both eyes. The distance between the eyepieces can be adjusted, but they are not always suitable for small children due to limited eyepiece adjustments.
- **Trinocular microscopes** are similar to binocular microscopes, but feature a third eyepiece for a teacher to use, or to attach a camera to.

Stereo microscope

A stereo microscope allows you to examine an object in 3D, as a slightly different image is delivered to each eye due to a stereo microscope using two separate optical paths with two objectives and eyepieces. They are designed for low magnification between 10x and 55x. This makes them ideal for studying insects, rocks, flowers, fabrics, and small objects such as coins.



ILLUMINATION

The quality of light is as important as the quality of the components of a microscope in obtaining an optimum image. There are four different types of lighting systems on most student microscopes, as follows.

Tungsten/halogen

Tungsten/halogen illumination is high voltage, and so must be plugged into the mains. It produces a very bright, white light, but gets hot so is not suitable for viewing live specimens.

LED

LED illumination is a relatively modern type of illumination. It runs very cool and produces a good white light. LED bulbs typically last for 20,000 hours and are low power, so LED microscopes are often battery-powered.

Incident illumination:

Incident illumination is when the object is illuminated from above, and the reflected light is used to see the specimen. This illumination is usually only used for stereo microscopes.

Transmitted illumination

Transmitted illumination is where light passes through the subject to illuminate it. This is used in all compound microscopes, and some stereo microscopes.

DIGITAL MICROSCOPES

Some microscopes feature a built-in camera (MI10590) which allows the viewing and capturing of images and video on computer. The user can watch the screen, where the images can be enlarged. Alternatively, the user can observe through the eyepiece.

An eyepiece camera can be installed on a normal microscope to turn it into a digital microscope and the camera can be moved from one microscope to another (V500M / MI210000).

The better the camera, the better the quality of the picture, and the finer the detail that can be seen.

TIP

When buying a class set of microscopes, consider buying multiple monocular microscopes for regular student use, and a digital binocular microscope for teacher-led demonstration and occasional advanced use at the front of the classroom.

WHY CHOOSE TIMSTAR?

Every year, Timstar provides quality equipment and resources to 5,000 education establishments worldwide, including 1,250 UK academies, and we help 2.5 million students globally to improve attainment in science.

Over 5,000 queries are effectively handled yearly by our in-house technical experts and our responsive customer service team is always dedicated to your needs.

Timstar stocks an extensive range of microscopes that have been chosen specifically for their suitability for education. These competitively priced microscopes include up-to-date requirements for the needs of today's young scientists.

We are also delighted to introduce KERN microscopes, which we sell exclusively to UK schools.

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