Resolution and magnification essay sample

Science, Biology

* State the resolution and magnification that can be achieved by an electron microscope.

* explain the need for staining samples for use in electron microscopy Lesson 2

* calculate linear magnification of an image such as photomicrograph or electron micrograph Key words

* Resolution= the ability to distinguish 2 separate points as distinct from each other. * Magnification= the number of times greater an image is than the actual object itself. Light microscopes have a low resolution, therefore if the magnification is above x1500then the image is not clear. If you use an electron microscope then u can achieve a higher resolution. How an electron microscope works...

Firstly electron microscope generates a lot of electrons. The beam of electrons has a wavelength of 0. 004 nanometres . this allows the microscope to see the difference between an objects that are only 0. 2 nanometres apart. Electron microscopes use magnets instead of actual lenses to focus the beam on the specimen u want to magnify. Electrons are not visible to the human eye so the image produced is projected onto a screen or photographic paper, this make a black and white image appear. The resolution of an electron microscope is 500 000 times greater than that of a human eye. In transmission electron microscopes (TEM), electrons are generated and pass through a thin sample. The electron passes through the thinner part of the sample easily and the denser part of the sample less easily.

So this gives some contrast in the image that is going to be produced. The final image is produced in the viewing screen and is a 2- dimensional black and white image. The highest possible magnification with a TEM is x500 000. In transmission electron microscopes (TEM), electrons are generated and pass through a thin sample. The electron passes through the thinner part of the sample easily and the denser part of the sample less easily. So this gives some contrast in the image that is going to be produced. The final image is produced in the viewing screen and is a 2- dimensional black and white image. The highest possible magnification with a TEM is x500 000. Two types of electron microscopes

Transmission electron microscope

Scanning electron microscope (SEM)

Advantages | disadvantages|

* The resolution is 2000x more than a light microscope. * Electron microscope can produce detailed images of organelles inside cells. * SEM produced 3-D images which show us the contours and cellular arrangements or tissue arrangements.| * Electron beams are deflected by the molecules in the air; therefore have to be placed in a vacuum. * Expensive items * Needs high degree of skill and accuracy to use.| Why does staining samples need to be used in electron microscopy? When viewing samples of cells under a light microscope, staining of the sample with a coloured fluid is normally done, the stains are used to facilitate viewing. The cell structures become coloured making them more visible. Why does staining samples need to be used in electron microscopy?

When viewing samples of cells under a light microscope, staining of the sample with a coloured fluid is normally done, the stains are used to facilitate viewing. The cell structures become coloured making them more visible. In scanning electron microscope the microscopes generates electrons and are directed on to a sample or specimen. However the electrons don’t pass through the sample like they do on a TEM they instead are “ bounced off“ the sample. The final image is a 3-dimensional view of the sample. The highest possible magnification with an SEM is x100000. In scanning electron microscope the microscopes generates electrons and are directed on to a sample or specimen. However the electrons don’t pass through the sample like they do on a TEM they instead are “ bounced off“ the sample. The final image is a 3-dimensional view of the sample. The highest possible magnification with an SEM is x100000.

LESSON 2

* calculate linear magnification of an image such as photomicrograph or electron micrograph UNIT| SYMBOL| EQIVELENT IN METRES|

FRATION OF A

METRE|

METRE| m| 1| one|

DECIMETRE| dm| 0. 1| One tenth|

CENTIMETRE| cm| 0. 01| One hundredth|

MILLIMETRE| mm| 0. 001| One thousandth|

MICROMETRE| µm| 0. 000 001| One millionth|

NANOMETRE| nm| 0. 000 000 001| One thousandth millionth|

Resolution of the

* human eye is 100 µm

* Light microscope is 200 nm

* Electron microscope is 0. 20 nm

Values of eyepiece divisions at different magnifications

Magnification of the eye piece lens| Magnification of objective lens| Total magnification| Value of one eye piece division/µm| x 10| x 4| x 40| 25|

x 10| x 10| x 100| 10|

x 10| x 40| x 400| 2. 5|

x 10| X 100 (oil immersions lens)| x 1000| 1. 0|

The scale of the eyepiece graticule is arbitrary –it represents different lengths at different magnifications. The image of the specimen looks bigger at higher magnifications but the actual specimen has not increased in size. The eyepiece scale has to be worked out for each different objective lens.

Calibration of the eye piece graticule

* A microscopic ruler on a special slide, called a stage micrometre, is placed on the microscope stage * The ruler is 1mm long and divided in to 100 divisions

* Each division is 0. 01 nm or 10 µm

* With a x4 objective lens and a x10 eyepiece (magnification = 40), 40 epu(eye piece units)= 1mm(1000µ,) therefore 1 epu= 1000/40= 25µm * With a x10 objective lens(total magnification = x100), 100 epu= 1000µm. so 1 epu= 10µm Magnification and micrographs

There is a relationship between actual size, magnification and image size where; Actual size= Image size/magnification

This means that it is possible to work out either the magnification of a micrograph or drawing, or the actual size of the cell or part of the cell shown in the micrograph or drawing. This means that it is possible to work out either the magnification of a micrograph or drawing, or the actual size of the cell or part of the cell shown in the micrograph or drawing.