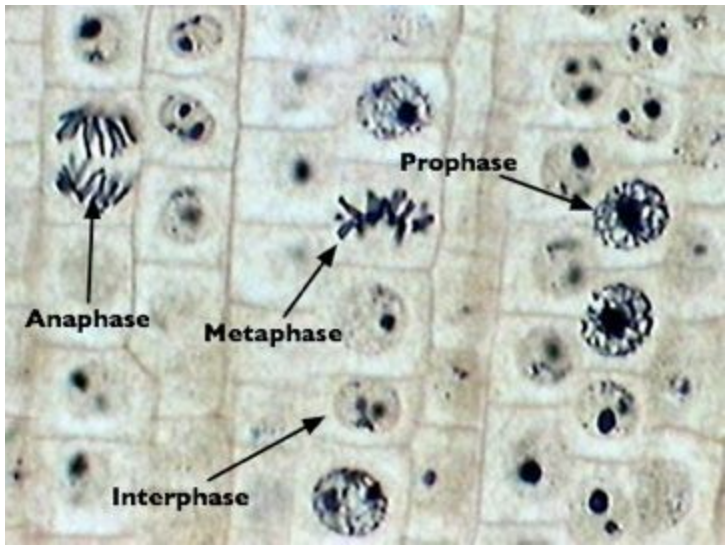
1. Investigating mitosis from plant root tips

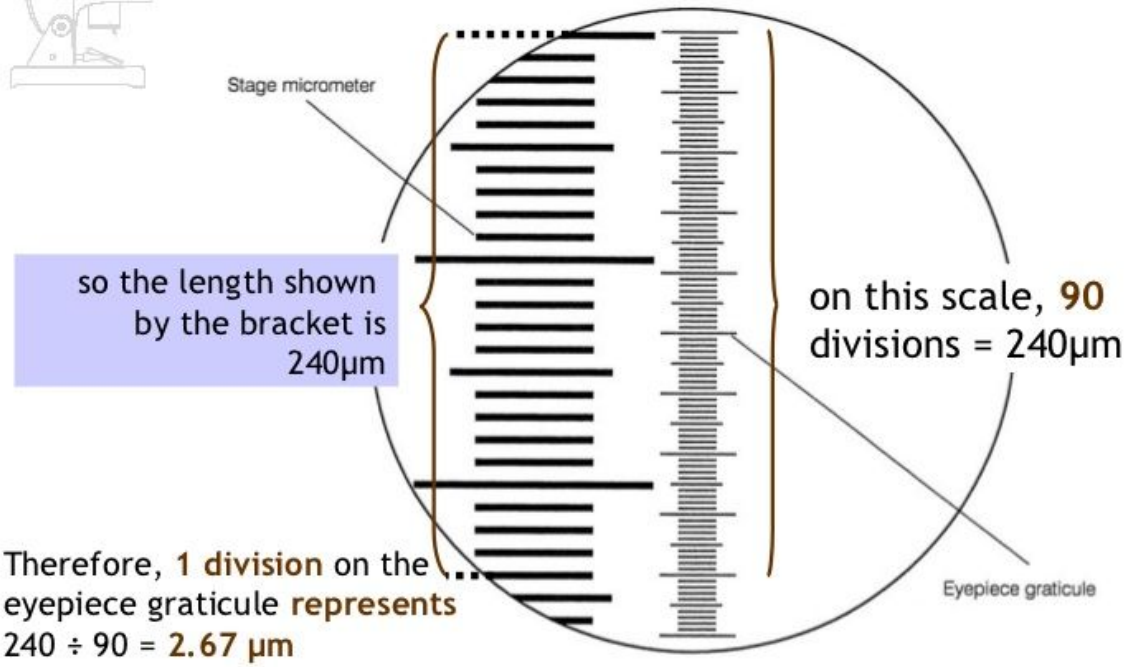
Why use onion roots for viewing mitosis?

• The roots are easy to grow in large numbers.
• The cells at the tip of the roots are actively dividing, and thus many cells will be in stages of mitosis.
• The tips can be prepared in a way that allows them to be flattened on microscopes slide (“squashed”) so that the chromosomes of individual cells can be observed.
• The chromosomes can be stained to make them more easily observable.



1. Cut the growing root tip of an onion with a sterile blade
2. Transfer to a tube, and add HCl
3. Rinse the root tips with distilled water
4. Add DNA-binding dye
5. Place on microscope stage and record the cell cycle stage

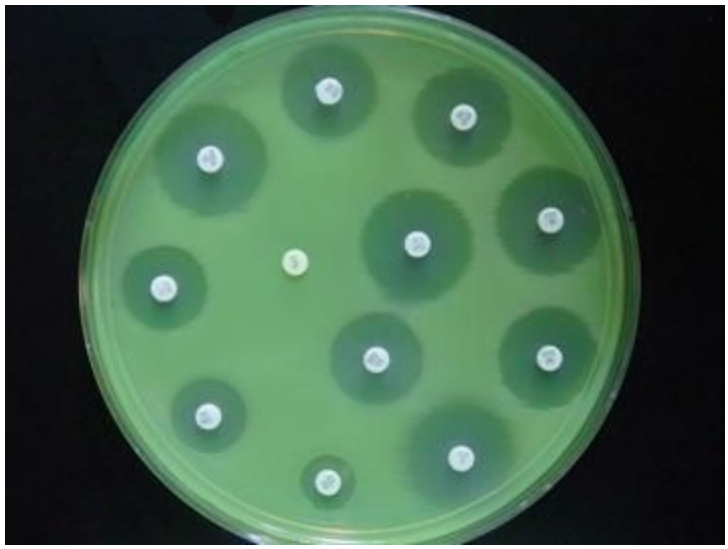
Figure 4.4
Part of the stage micrometer viewed at x400 magnification



Therefore, **1 division** on the eyepiece graticule **represents** 240 ÷ 90 = **2.67 µm** *at this magnification.*

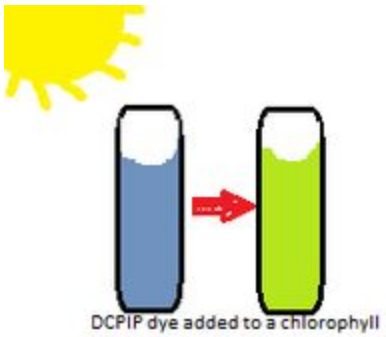
2. Use of aseptic techniques to investigate the effect of antimicrobial substances on microbial growth

1. Transfer an actively growing bacteria culture onto the surface of an agar plate, using aseptic techniques
2. Dip filter paper disc in antimicrobial substance
3. Remove excess fluid and place on the agar plate at a marked position
4. Incubate the plate at 37C for 24 h
5. Count the diameter of the zone of inhibition



3. Investigation into the effect of a named factor on the rate of dehydrogenase activity in extracts of chloroplasts

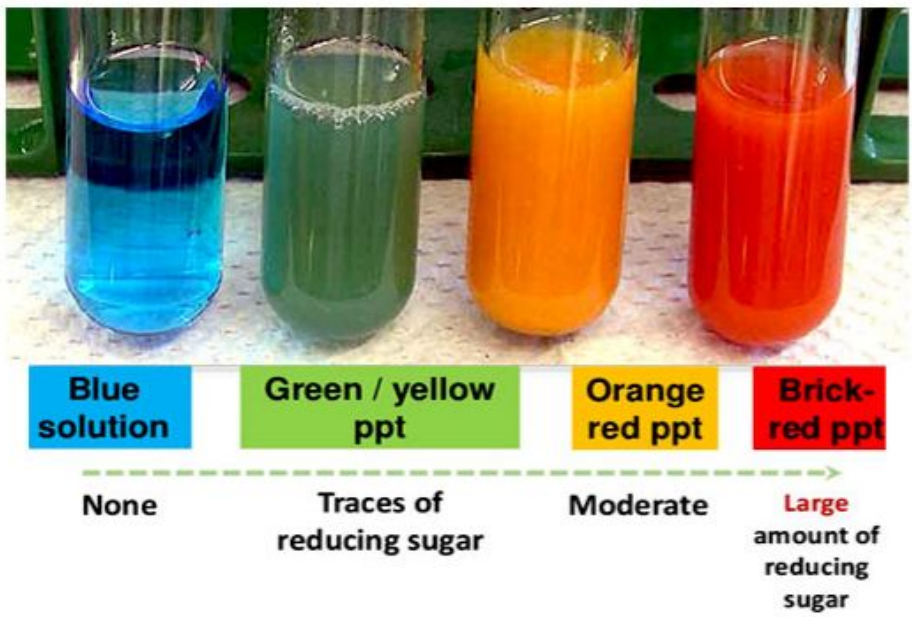
In this investigation, DCPIP (2,6-dichlorophenol-indophenol), a blue dye, acts as an electron acceptor and becomes colourless when reduced, allowing any **reducing agent produced by the chloroplasts** to be detected.



1. Grind a handful of spinach leaves, filter debris and extract chloroplasts by centrifugation
2. Transfer 5 cm3 to a test tube
3. Add 5 cm3 DCPIP and expose to light
4. Prepare controls = without chloroplast, and in the dark
5. Record the time taken to decolourise the DCPIP

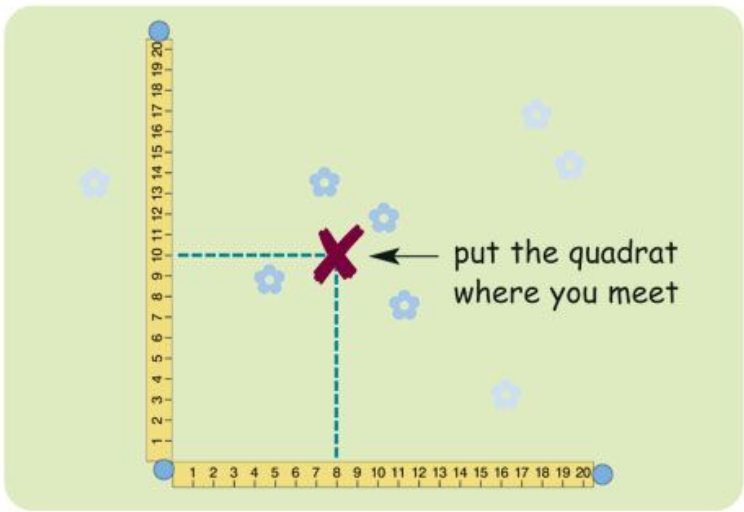
4. Production of a dilution series of a glucose solution and use of colorimetric techniques to produce a calibration curve with which to identify the concentration of glucose in an unknown 'urine' sample

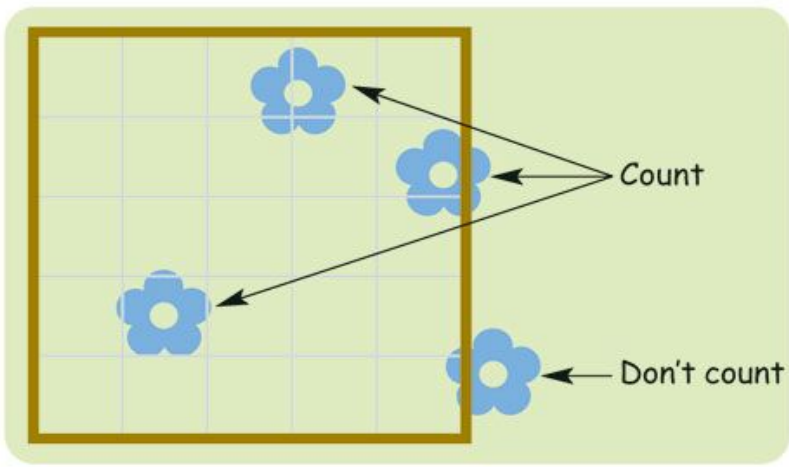
1. Approximately 1 ml of sample is placed into a clean test tube.
2. 2 ml (10 drops) of Benedict's reagent ($CuSO_4$) is placed in the test tube.
3. The solution is then heated in a boiling water bath for 3-5 minutes.
4. Observe for color change in the solution of test tubes or precipitate formation.



5. Investigation into the effect of a named environmental factor on the distribution of a given species

Random sampling allows you to make an estimate of the populations of different **species** in any area.





6. Dissection of animal or plant gas exchange or mass transport system or of organ within such a system