Microscope Calculations Worksheet

1. Calculate the total magnification for the following:

a) low power objective = 5X; eyepiece = 4X 20 X

b) high power objective = 40X; eyepiece = 5X 200 X

c) med. power objective = 10X; eyepiece = 10X 100 X

2. Calculate the number of µm present in the following:

a) 4.5mm = 4500 µm

b) 3.8cm = 38 000 µm

c) 2.5 mm = 2500 µm

3. Calculate the field of views using the given information:

a) low power objective = 4X

high power objective = 40X

eyepiece lens = 10X

low power field of view (FOV) = 4.4 mm

What is the high power field of view? 0.44 mm

$M_{HP} = (40x)(10x) = 400x$

$M_{LP} = (4x)(10x) = 40x$

$FV_{LP} = 4.4mm$

b) low power objective = 5X

med power objective = 10X

eyepiece lens = 5X

low power field of view (FOV) = 3.5 mm

What is the medium power field of view? 1.75 mm

$M_{LP} = (5x)(5x) = 25x$

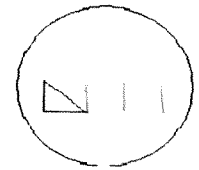
$M_{MP} = (10x)(5x) = 50x$

$F_{LP} = 3.5mm$

$F_{MP} = \frac{F_{LP} \times M_{LP}}{M_{MP}} = \frac{(3.5mm)(25x)}{(50x)} = 1.75mm$

4. The diagrams below represent what can be seen through an imaginary microscope. You have been given information along with the diagrams. Using the information provided, calculate the size of the objects viewed.

a



This triangicium is being viewed under medium power.

low power objective = 4X

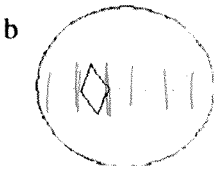
medium power objective = 10X

high power objective = 40X

eyepiece = 5X

low power FOV = 4.2 mm

b



This diamondogram is being viewed under high power.

low power objective = 5X

medium power objective = 40X

high power objective = 100X

eyepiece = 10X

low power FOV = 3.5mm

fit ≅ 4

$FV_{LP} = 4.2mm$

$M_{LP} = (4)(5) = 20x$

$M_{MP} = (10x)(5x) = 50x$

$FV_{MP} = FV_{LP} \times \left(\frac{M_{LP}}{M_{MP}}\right)$

$= (4.2mm)\left(\frac{20x}{50x}\right)$

$= 1.68mm$

$Est = \frac{FV}{4} = \frac{1.68mm}{4}$

fit ≅ 6

$FV_{MP} = ?$

$FV_{LP} = 3.5mm$ $M_{LP} = (5x)(10x) = 5$

$M_{MP} = (100x)(10x) = 1000x$

$FV_{MP} = FV_{LP} \times \frac{M_{LP}}{M_{MP}}$

$= (3.5mm)\left(\frac{50x}{1000x}\right) =$

$= 0.175mm$

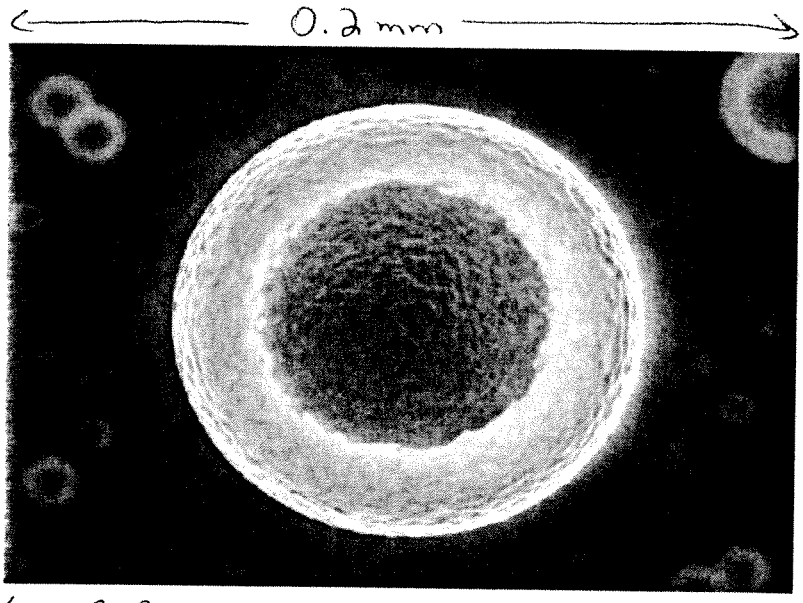
Review Calculations

Answer the following calculations on a separate piece of paper.

1. Calculate the field of view under high power, for a microscope with a low power field of view of 5 mm, a low power magnification of 5X and a high power magnification of 15X.

$$\frac{FV_{HP}}{FV_{LP}} = \frac{M_{LP}}{M_{HP}} \Rightarrow F_{HP} = \frac{M_{LP} \times F_{LP}}{M_{HP}} = \frac{(5mm)(5x)}{15x} = 1.67 \text{ mm}$$

2. Estimate the diameter of the human stem cell shown below, if the field of view (from left to right) is 0.2 mm.



FV = 0.2 mm

fit ~ 1.5

$$\text{Est diameter} = \frac{FV}{\#\text{fit}}$$

$$\text{Estimated diameter} = \frac{0.2 \text{ mm}}{1.5} = 0.1\overline{3} \text{ mm}$$