Name -

Microscopes Markscheme

1. State the equation to calculate magnification using an image and its actual size.

Magnification = Size of Image / Size of Real Object

2. Explain why electron microscopes are particularly useful.

They have a much higher magnification and resolution than light microscopes, meaning that even smaller objects can be looked at, furthering understanding of sub-cellular structures.

3. Use the magnification equation to help you complete the missing values in the table. Show all working and units where necessary.

Size of Image	Size of Object	Magnification
10 mm	0.001 mm	*Magnification = image/object* **10 mm/0.001 mm= 10000**
20 mm	*Object = Image/magnification* **20 mm/5000 = 0.004 mm**	5000
Image = Object x magnification **0.005 mm x 10000 = 50 mm**	5 µm **(= 0.005 mm)**	10000
15 mm	0.03 mm	*Magnification = image/object* **15 mm/0.03 mm = 500**
0.5 cm **(= 5 mm)**	*Object = Image/magnification* **5 mm/2500 = 0.002 mm**	2500
Image = Object x magnification **0.035 mm x 1000 = 35 mm**	0.035 mm	1000

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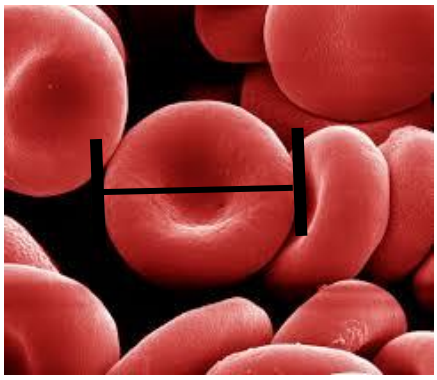
4. The image below shows a chloroplast which has a length of 50 µm.

   a. Is 50 µm the image size or actual object size? **Actual object size.**

   b. Use a ruler to measure the length of the bar in the image. **Depends on paper size for printing, measure with ruler (in mm)**

   c. Use your measurement to calculate the magnification used to produce this image. **Magnification = Value from measurement / 0.05 mm**
   =_____

5. The image below shows a selection of red blood cells, with the diameter of one marked.



Measure the length of the diameter in the image. This image was obtained at a magnification of 5000.

Use this information to calculate the actual diameter of this red blood cell.

Magnification = Image size / Size of actual object

Size of actual object = Image size / Magnification

Object = Measured diameter (mm) / 5000

= _____ mm

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6. Ova have an approximate length of 0.1 mm. How big should an image of an ovum appear if it has been magnified 100 times?

Magnification = Image size / Size of actual object

Image size = Magnification x size of actual object

= 100 x 0.1

= 10 mm