B1 L3 Challenge worksheet: Using a microscope

Name: _____ Class: _____

A. Changing the objective lens

Help: online screens 4 and 8 [6]

A student used a × 10 eyepiece lens. She looked at the same onion slide with three objective lenses. Each time she measured the diameter of the field of view. Table 1 shows her results.

Table 1

Objective lens	Total magnification	Field of view (mm)
× 4		4.0
× 10	× 100	1.6
× 40		0.4

(a) Complete Table 1. [2]

(b) Name the independent variable and the dependent variable in her investigation. [2]

Independent: _____

Dependent: _____

(c) Describe the pattern in her results. [1]

_____

_____

(d) Give one variable she kept the same. [1]

_____

B. Seeing small things

Help: online screens 11 and 12 [6]

Table 2 gives the resolution of two microscopes and the sizes of three sub-cellular structures. 1 µm = 1000 nm.

Table 2

Microscope or structure	Resolution or size
light microscope	0.2 µm
electron microscope	0.2 nm
nucleus	about 6 µm across
mitochondrion	about 1 µm long
ribosome	about 25 nm across

(a) Convert the resolution of the light microscope into nanometres (nm). [1]

_____ nm

(b) The resolution of the electron microscope is 0.2 nm. How many times smaller is this than the resolution of the light microscope? Use your answer to (a). Show your working. [2]

_____ times

(c) Use Table 2 to explain why ribosomes can be seen with an electron microscope but not with a light microscope. [2]

_____

_____

_____

(d) Can a light microscope show a nucleus? Use Table 2 to give a reason. [1]

_____

_____

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C. Looking at a pondweed leaf

Help: online screens 1, 6 and 12 [4]

A student puts a pondweed leaf in a drop of water on a slide. She adds a coverslip but no stain. The leaf is only two cells thick. She sees green chloroplasts moving round the edges of brick-shaped cells.

(a) Suggest why she does not need to add a stain. [1]

(b) Explain why the leaf can be looked at without peeling a thinner layer. [1]

(c) She wants to see the inside of a chloroplast. Suggest what she should use, and explain why. [2]

D. Extended response

Help: online screens 6, 7 and 8 [6]

A student looked at a slide of onion cells. He wrote: ‘The image was dark. In some places the cells were on top of each other. I could see lots of round shapes with thick black edges. When I turned to the × 40 objective lens and turned the big knob, I heard a crack.’

Explain what the student did wrong, and how he should improve his method. [6]